Tax Differentials between US and European Firms

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Vorwort

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Köln, im November 2018 Sabine Schenkelberg

Content

Chapter 1

Introduction

Chapter 1

1.1 Motivation and Object of Research

US President Donald Trump signed the "Tax Cuts and Jobs Act" to "*make America competitive again*"[1] on December 22, 2017. Among others, a competitive disadvantage for US firms was perceived due to the relatively high statutory tax rate: with 35 %, the US tax rate for corporations belonged to the highest in a worldwide comparison. Furthermore, the applicable worldwide tax system in the US imposed taxes on foreign income upon repatriation, while most European countries follow the territorial tax system and exempt foreign profits from taxation. The combination of the high home country tax rate and the worldwide tax system raised the perception that US firms paid higher taxes compared to their worldwide competitors. Thus, policymakers reduced the US statutory tax rate to 21 % and replaced the worldwide tax system by a territorial tax system in the beginning of 2018.

However, a previously raised debate on tax avoidance strategies highlights in particular low effective tax rates (ETRs) of US firms and does not suggest that (all) US firms face high tax expenditures – not even prior to the US tax reform. For example, Amazon.com, Inc. is accused of paying only 3.6 % taxes worldwide in 2011,[2] while Google LLC and Apple Inc. are claimed to have very low foreign effective tax rates of 3.2 % and 2.5 %, respectively.[3] Moreover, in an interview regarding the tax planning strategies of Apple Inc., Margrethe Vestager (the European Union's commissioner for competition) said that it "*is irritating when American companies pay less in taxes than European ones*"[4]. Her statement demonstrates that the perception of a competitive disadvantage of US firms is not shared by everyone.

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1 *The Hill* (11/12/2017), available at http://thehill.com/opinion/finance/364206-making-america-competitive-again.

2 *Huffington Post* (17/04/2012), available at https://www.huffingtonpost.com/2012/04/17/apple-corporate-income-tax-rate_n_1429955.html.

3 *Bloomberg* (11/12/2012), available at https://www.gadgetsnow.com/it-services/How-Google-saved-2-billion-in-income-tax/articleshow/17567959.cms; *Business Insider* (05/11/2012), available at http://www.businessinsider.com/apple-tax-rate-2012-11?IR=T.

4 *Bloomberg* (19/09/2016), available at http://www.bloomberg.com/news/articles/2016-09-19/eu-s-vestager-signals-apple-just-the-start-of-u-s-tax-probes.

Those tax strategies of Apple Inc., Google LLC and Amazon.com, Inc. were also noticed by the Organization for Economic Cooperation and Development (OECD). With its project against Base Erosion and Profit Shifting (BEPS) the OECD endorsed a plan consisting of 15 actions to hinder tax planning strategies that are inconsistent with the purpose and intent of tax legislation (Kadet, 2016). While so-called Controlled Foreign Company (CFC) rules are already implemented in many countries worldwide to circumvent profit shifting activities to low-tax countries, US CFC rules are often said to be ineffective and may be the reason for the very low tax expenditures of US firms.[5] Similarly, European CFC rules are thought to become less restrictive after the European Court of Justice's (ECJ) "Cadbury Schweppes" [6] judgment in 2006 limited the application to "wholly artificial arrangements". Thus, among others aims, the OECD intends with its BEPS action plan to strengthen anti-tax avoidance measures such as CFC rules (OECD, 2015).

In a globalized world, US and European firms compete with each other. Therefore, it is of particular interest whether one group faces a competitive (dis)advantage and why differences in tax expenditures exist. As anecdotal evidence regarding the competitiveness differs between the US and the European perspective, it is not clear whether in reality US or European firms are paying less tax. In addition, uncertainty exists whether initiatives such as the US tax reform or the OECD action plan are suitable to reduce those tax differentials. This thesis aims to enhance the understanding of tax differentials between US and European firms by considering the following challenges.

First, the determination of an appropriate measure is crucial when comparing tax expenditures between US and European firms. While a myriad number of proxies for tax expenditures exists, differences that arise due to different measures are understood only

[5] *Tax Justice Blog* (20/07/2015), available at http://www.taxjusticeblog.org/archive/2015/07/like_a_campy_horror_ movie_the.php#.V-gdyclrPo0.

[6] Judgment from September 12, 2006, C-196/04.

roughly. Thereby, it is important to understand the information content of the proxies used when comparing tax expenditures between US and European firms. ETRs are common measures for tax expenditures and are built by a ratio of tax expenditures and pre-tax income. Previous research spends effort in defining different ETRs (e.g., Dyreng, Hanlon, and Maydew, 2008) and in interpreting the information content of each (e.g., Hanlon and Heitzman, 2010). However, previous research that analyzes ETRs between US and European firms comes to confounding results at a first glance: PricewaterhouseCoopers (2011) finds higher tax expenses in terms of *GAAP ETRs* for US firms, while Avi-Yonah and Lahav (2012) suggest lower tax expenses in terms of *CURRENT ETRs* for US firms. With regard to those findings, it is not clear whether the differences arise due to the sample selection of different studies or whether they might be caused by different ETR measures.

Second, the determinants of tax differentials are of particular interest when evaluating the potential consequences arising from the US tax reform. Prior literature suggests for example that businesses with high values of intangibles and research and development expenses are more engaged in profit shifting activities (Grubert, 2003; Harris, 1993). However, the home country tax legislation such as the statutory tax rate, CFC rules (Dyreng, Hanlon, Maydew, and Thornock, 2017; Dunbar and Duxbury, 2015; Grubert, 2012) or the international tax system (Dyreng and Markle, 2016; Markle, 2016; Atwood, Drake, Myers, and Myers, 2012) also impact tax expenditures. Markle and Shackelford (2012) suggest further that the location of a firm's headquarters affects its worldwide tax expenditures. However, it is largely unexplained whether the tax differential between US and European firms arises from differences in firm characteristics, profit shifting opportunities or the home country tax legislation.

Third, the OECD puts efforts into strengthening CFC rules with its ongoing BEPS action plan. While US CFC rules in particular are criticized of being ineffective, less is known about the effectiveness of European CFC rules. Ruf and Weichenrieder (2012) suggest that German

CFC rules were effective, as they find lower passive assets in subsidiaries affected by German CFC rules. Further studies confirm the economic relevance of European CFC rules (Egger and Wamser, 2015; Karkinsky and Riedel, 2012). However, the ECJ required with its "Cadbury Schweppes" judgment of 2006 amendments to European CFC rules. As the application of CFC rules within Europe seems to become less restrictive after the ECJ judgment (Bräutigam, Spengel, and Streif, 2017), Ruf and Weichenrieder (2013) suggest an increase of passive investments in European low-tax subsidiaries of German multinational corporations (MNCs) afterwards. Beyond this finding, empirical evidence regarding the effectiveness of European CFC rules after the ECJ judgment is still scarce.

The three essays of this thesis aim to contribute to the presented research gaps. The first essay "Alternative Effective Tax Rate Measures – An Assessment of Differences between US and European Firms" is a single author paper and thus has been created entirely under my own responsibility. The paper evaluates the information content of five different ETR measures and demonstrates the differences thereof between US and European firms. The analyses improve the understanding of the impact of tax and accounting legislation on different ETR measures.

The second essay "Do US Firms Pay Less Tax than their European Peers? On Firm Characteristics, Profit Shifting Opportunities, and Tax Legislation as Determinants of Tax Differentials" is co-authored by Michael Overesch, Chair of Business Taxation at the University of Cologne and Georg Wamser, Chair of Public Finance at the University of Tuebingen. Among others, my contribution to this essay was the data collection and the implementation of all empirical analyses. The essay builds on the first essay, as it uses different ETR measures to analyze the tax differentials between listed US and European firms and the determinants thereof. With a more detailed approach it further investigates whether tax differentials between US and European firms can be attributed to firm characteristcs, profit shifting opportunities and home country tax legislation. Analyzing the determinants of those

tax differentials improves the understanding of the consequences arising from the US tax reform in 2017. The paper was presented at the Doctoral Research Seminar in Cologne 2016, the 3rd WU – Vienna University of Economics and Business Doctoral Seminar in Vienna 2016, the 40th European Accounting Association Annual Congress in Valencia 2017, the 3rd Berlin-Vallendar Tax Conference in Vallendar 2017, the 4th Annual MaTax Conference in Mannheim 2017, the Seminar at Erasmus University Rotterdam 2018, and the Faculty Seminar of the Norwegian Centre for Taxation in Bergen 2018.

The thesis concludes with the essay "The Cadbury Schweppes Judgment and its Implications on Profit Shifting Activities within Europe", which is a single-author paper. Thus, except for a few comments on earlier versions, the complete essay has been developed by myself. The essay analyzes the impact of amendments to European CFC rules on profit shifting activities of European-owned subsidiaries compared to US-owned subsidiaries. While the second essay of this thesis analyzes the impact of CFC rules on the overall tax expenditures (ETRs) of MNCs, the third essay considers the subsidiary level of MNCs and analyzes the impact of CFC rules on pre-tax earnings. Further, the relative importance of different profit shifting channels is elaborated. Evaluating the Cadbury Schweppes judgment in more detail demonstrates the impact of CFC rules on profit shifting activities within Europe and gives suggestions on whether the intended OECD action of strengthening CFC rules will be effective in preventing undesired tax avoidance strategies. The paper was presented at the Doctoral Research Seminar in Cologne 2018 and the 41th European Accounting Association Annual Congress in Milan 2018.

1.2 Alternative Effective Tax Rate Measures – An Assessment of Differences between US and European Firms

1.2.1 Research Question and Design

The first essay "Alternative Effective Tax Rate Measures – An Assessment of Differences between US and European Firms" evaluates the expressive power of different ETR measures as proxies for tax expenditures. ETRs are common measures when analyzing tax expenditures, either in empirical research or by media coverage. However, studies that use different ETR measures when comparing tax expenditures between US and European firms suggest controversial results at a first glance. While higher *GAAP ETRs* for US firms are found by PricewaterhouseCoopers (2011), lower *CURRENT ETRs* of US firms are suggested by Avi-Yonah and Lahav (2012).

My study reviews the definitions of five ETR measures and points out the differences thereof. Thereby, I concentrate on the so-called *GAAP ETR, CURRENT ETR*, *CASH ETR*, *CASH ETR*5, and *FOREIGN ETR*. To illustrate the differences between ETRs and the explaining impacts, I compare those measures between US and European firms and demonstrate differences that for example, arise over time or exist between different subsamples. Further, I conduct a case study and analyze the ETRs of three US firms (Apple Inc., Amazon.com, Inc., and Google LLC) and one European firm (the German-based SAP SE). Additional information gathered from the notes to income taxes of the consolidated statements supports the understanding of the impact of tax and accounting legislation on ETRs.

My explorative analyses are based on US and European firms with consolidated financial data information in the *Compustat* and *Compustat Global* databases. Calculating the *FOREIGN ETR* of European firms requires also unconsolidated financial statement information and ownership structures reported by the *Amadeus* database. The main analyses focus on the

most recent years 2011 to 2015, while some additional analyses go back to the year 1996. The basic sample consists of 3,456 US firms and 2,826 European firms.

1.2.2 Results and Contribution to the Literature

My analyses suggest that higher *GAAP ETRs* of US firms compared to European firms are attributable to higher deferred tax expenses of US firms. Comparisons of ETRs that do not include domestic deferred tax expenses (i.e., *CURRENT ETR, CASH ETR, CASH ETR5,* and *FOREIGN ETR),* suggest lower ETRs for US firms compared to European firms. The analyses demonstrate further that in particular the home country tax and accounting legislations should be considered before criticizing the low level of an ETR measure. E.g., lower *CASH ETRs* of US firms do not necessarily arise due to tax aggressive strategies, as specific accounting legislation on employee stock options under US GAAP can also result in low cash taxes paid.

Knowing what each measure is (not) able to capture and noticing the impacts on different ETR measures improves the understanding of supposedly contradictory results of prior research. Thus, my paper contributes to research that compares ETR measures of different countries (Avi-Yonah and Lahav, 2012; Markle and Shackelford, 2012; PricewaterhouseCoopers, 2011; Swenson and Lee, 2008) and those that are discussing suitable proxies for tax expenditures (Blouin, 2014; Hanlon and Heitzman, 2010). The implications of my study should assist future research in choosing an appropriate ETR measure. My results further raises sensitivity for judgments based on one single ETR measure, as a low ETR does not necessarily arise due to aggressive tax strategies.

1.3 Do US Firms Pay Less Tax than their European Peers? On Firm Characteristics, Profit Shifting Opportunities, and Tax Legislation as Determinants of Tax Differentials

1.3.1 Research Question and Design

The second essay "Do US Firms Pay Less Tax than their European Peers? On Firm Characteristics, Profit Shifting Opportunities, and Tax Legislation as Determinants of Tax Differentials" builds on the first essay and examines the tax differentials between US MNCs and their European peers in more detail. With the tax reform "Tax Cuts and Jobs Act" enacted in December 2017, the US responded to arguments that US MNCs are disadvantaged in a worldwide comparison. First, the relatively high statutory tax rate has been criticized and second, the applicable worldwide tax system was seen as a disadvantage for US MNCs (e.g., Swenson and Lee, 2008). While foreign profits were taxed when repatriated to the US, most European countries have implemented the territorial tax system and exempt foreign income from taxation. However, not everyone agrees with those arguments and very low ETRs of US MNCs are used to counteract. E.g., with regard to Apple Inc., which achieved an effective foreign tax rate well below 4 % in recent years, the European Union's commissioner for competition has seen a competitive advantage for US firms compared to their European peers already prior to the US tax reform.[7]

With this study we add to the current debate, whether US MNCs or their European peers pay less tax. Further, we are interested in the determinants of tax differentials and if those can be attributed to differences in firm characteristics or in the home country tax legislation between the US and Europe. We consider differences in home country statutory tax rates, tax planning

[7] *Bloomberg* (19/09/2016), available at http://www.bloomberg.com/news/articles/2016-09-19/eu-s-vestager-signals-apple-just-the-start-of-u-s-tax-probes. For more examples, see *The Financial Times* (30/09/2013), available at http://www.ft.com/cms/s/0/c6ff0ebc-29c4-11e3-bbb8-00144feab7de.html.

opportunities, CFC rules, and taxation systems of foreign income as potential explanations for tax differentials between US and European MNCs.

In our analyses, we use *GAAP ETR* and *FOREIGN ETR* as measures for tax expenses. First, we employ a one-to-one propensity score matching with regard to observable firm characteristics and industry belongings to create pairs of very similar US and European MNCs. We then include pair fixed effects, given the prior matched pairs, in the regressions to analyze tax differentials between very similar US and European MNCs. We continue our analyses by including the home country statutory tax rates and proxies for profit shifting opportunities into the regressions to investigate whether these are determinants of tax differentials. Finally, we consider different tax reforms to investigate the influence of the home country tax legislation. We conduct a difference-in-differences set up to analyze how changes in the application of CFC rules and the international tax system affect tax expenses. Therefore, we consider the "Check the Box" (CTB) introduction and the Cadbury Schweppes judgment as tax reforms on US and European CFC rules in 2002 and 2006, respectively. The abolishment of a worldwide tax system in 2009 in the UK is used to investigate the impact of the international tax system.

Our empirical analyses are based on large MNCs listed on the S&P500 or StoxxEurope600 stock market indices. Our final sample considers the period 1995 to 2015 and consists of 965 US firms and 1,015 European firms. We use consolidated financial data information from the *Compustat* and *Compustat Global* database. The sample is completed with unconsolidated financial data information and ownership structures reported by the *Amadeus* database.

1.3.2 Results and Contribution to the Literature

For the most recent years of 2012 to 2015, we find that US MNCs report a higher *GAAP ETR* compared to their European peers. However, a 3.3 percentage points lower *GAAP ETR* for

US MNCs is found if we condition on the home country tax rate. Irrespective of the home country tax rate US MNCs have significantly lower *FOREIGN ETRs*.

Our analyses suggest that observable firm characteristics and the home country tax legislation explain most of the tax differential between US and European MNCs. First, the differences in ETRs between US and European MNCs can partially be attributed to enhanced profit shifting opportunities of US MNCs. Second, we demonstrate the impact of CFC rules. We show that ETRs of US MNCs fell after CFC rules became less effective with the CTB introduction in 2002. A similar effect is found for European MNCs after the Cadbury Schweppes judgment in 2006. While CFC rules affect the *GAAP ETR* and the *FOREIGN ETR,* the international tax system impacts the *GAAP ETR* only: the switch to a territorial tax system in UK has reduced the *GAAP ETR* while the *FOREIGN ETR* of UK-based MNCs is unchanged. Finally, a residual tax differential between US and European MNCs has to be attributed to unobservable effects associated with being a US firm.

Those findings help to interpret the impacts of the US tax reform on the tax differential between US and European MNCs. First, a lower US statutory tax rate will compensate the disadvantage of US MNCs arising from a higher home country tax rate compared to European MNCs. However, the considered applicable tax rate of 21 % is quite low and thus, will result in a competitive advantage for US firms. Moreover, the switch to a territorial tax system will further increase the tax differential in terms of *GAAP ETR* between US and European firms. However, the changes in the international tax system will not affect the tax differential in terms of *FOREIGN ETR* between US and European firms.

Previous studies compare tax expenditures of US and European MNCs (Avi-Yonah and Lahav, 2012; PricewaterhouseCoopers, 2011). We contribute to this strand of literature and provide a thorough comparison of tax expenses between US and European MNCs as our approach uses different measures of ETRs. Allowing for pairwise comparisons and

conditioning on firm-specific characteristics, our analyses support the findings of the unconditional comparisons in the first essay of this thesis. Moreover, we attribute the tax differential to firm characteristics and home country tax legislation and thus, contribute to prior literature that analyzes the determinants of effective tax expenses (Dyreng, Hanlon, Maydew, and Thornock, 2017; Plesko, 2003; Rego, 2003), changes in CFC rules (Dunbar and Duxbury, 2015; Ruf and Weichenrieder, 2013; Altshuler and Grubert, 2006), and changes in the international tax system (Markle, 2016; Egger, Merlo, Ruf, and Wamser, 2015; Atwood, Drake, Myers, and Myers, 2012).

1.4 The Cadbury Schweppes Judgment and its Implications on Profit Shifting Activities within Europe

1.4.1 Research Question and Design

The essay "The Cadbury Schweppes Judgment and its Implications on Profit Shifting Activities within Europe" analyzes the impact of changes in CFC rules on profit shifting activities in more detail. CFC rules are established in many countries worldwide to limit profit shifting activities. In 2006, European countries had to adjust their CFC rules after the ECJ decided with its Cadbury Schweppes judgment that those rules infringe the principle of freedom of establishment. Thus, nowadays CFC rules are applicable to only wholly artificial arrangements within Europe.

As the threshold to prevent the application of CFC rules within Europe is quite low after the Cadbury Schweppes judgment (Bräutigam, Spengel, and Streif, 2017), CFC rules are thought to be less effective in preventing profit shifting activities. Thus, European MNCs might increase those activities within Europe to minimize their overall tax payments. Thereby, several strategies can be used to shift pre-tax earnings to subsidiaries located in low-tax countries. The main channels are thought to be transfer pricing distortion and debt shifting activities (Dharmapala, 2014).

Addressing those issues, my empirical analyses are tripartite: first, I analyze whether less effective CFC rules result in an increase of pre-tax earnings of subsidiaries located in European low-tax countries. As only subsidiaries with a European parent company are affected by the ECJ judgment, I compare pre-tax earnings from subsidiaries with a European parent company to (unaffected) US-owned subsidiaries by implementing a difference-in-differences setting. In the second step of my analyses, I investigate whether the increase in pre-tax earnings is caused by profit shifting activities. Related to the first and second step, I analyze third, which profit shifting channels are used to shift pre-tax earnings to low-tax countries.

The empirical analyses are based on a dataset of 5,449 subsidiaries located in European low-tax countries. The sample period is restricted to the years from 2003 to 2011. The unconsolidated financial statement information is extracted from the *Amadeus* database. Statutory tax rate information were collected from tax surveys provided by PwC, KPMG, and EY. Country-specific characteristics as GDP, GDPC, the unemployment rate, and the corruption index are retrieved from the World Development Indicator Database and the Worldwide Governance Indicators.

1.4.2 Results and Contribution to the Literature

The results of my difference-in-differences estimates confirm that European CFC rules became less effective in preventing profit shifting activities after the Cadbury Schweppes judgment. Pre-tax earnings of affected subsidiaries increase by approximately 10 % after the judgment in 2006. The finding is supported by several robustness tests. A more pronounced treatments effect is found for MNCs with enhanced profit shifting incentives or opportunities. The findings suggest that the increase in pre-tax earnings after the ECJ judgment is related to profit shifting activities. On average, 90 % of the increase in pre-tax earnings is attributable to transfer pricing activities, while less than 10 % is caused by debt shifting activities. All in all my findings suggest that strengthening CFC rules, as currently being pursued by the OECD,

could limit profit shifting activities. Moreover, my results contribute to the comparisons between the US and European home country tax legislations as they suggest that currently not only US but also European CFC rules do not circumvent profit shifting activities entirely.

Prior literature suggests that CFC rules are effective in preventing profit shifting activities (Egger and Wamser, 2015; Ruf and Weichenrieder, 2012; Altshuler and Hubbard, 2002). Ruf and Weichenrieder (2013) analyze the impact of the Cadbury Schweppes judgment on the allocation of passive assets and suggest that German firms started to use low-tax countries within Europe more heavily after 2006. The second essay of this thesis shows that the overall tax expenses (ETRs) of European MNCs decrease after the Cadbury Schweppes judgment. In addition, little is known about the consequences of the ECJ judgment on profit shifting activities within Europe. My analyses provide new insights to the impact of the ECJ judgment on profit shifting activities and to the relative importance of transfer pricing and debt shifting activities. Thus, the study contributes further to previous literature analyzing profit shifting channels (Heckemeyer and Overesch, 2017; Dharmapala and Riedel, 2013).

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Chapter 2

Alternative Effective Tax Rate Measures – An Assessment of Differences between US and European Firms

Alternative Effective Tax Rate Measures – An Assessment of Differences between US and European Firms

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Abstract:

This paper describes five different effective tax rate (ETR) measures and analyzes their differences between US and European firms. Comparisons of *GAAP ETRs* suggest higher tax expenditures for US firms than for European firms. However, with regard to other ETR measures (e.g., *CURRENT ETR*, *CASH ETR, CASH ETR5,* and *FOREIGN ETR)* lower tax expenditures are found for US firms. The analyses demonstrate that the higher *GAAP ETRs* of US firms are attributable to higher deferred tax liabilities. A case study with four firms enables a more detailed analysis of additional information from the notes of the financial statements. The findings suggest that the *GAAP ETRs* and *CURRENT ETRs* of US MNCs depend on the classification choices concerning undistributed foreign earnings. Further, specific accounting legislation for employee stock options can explain low *CASH ETRs*.

Keywords: Effective Tax Rate, Tax Avoidance, Tax Expenses, Taxes Paid, Accrual Accounting

Chapter 2

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2.1 Introduction

Apple Inc. (in the following "Apple"), Amazon.com, Inc. (in the following "Amazon"), Google LLC (in the following "Google") and most of the other firms accused of being tax aggressive in a recent debate are headquartered in the US. Thus, it is astonishing that the *Tax Foundation* assumes higher effective tax rates (ETRs) for US firms than for non-US firms.[8] For example, Amazon is criticized for paying less than 3.6 % of its income on taxes in 2011.[9] However, it is not mentioned in that context that Amazon's average effective tax rate (*GAAP ETR*) is 31.6 % and therewith higher than the mean ETR of US firms in the same year. Further, Apple is claimed as being "*America's largest tax avoider*"[10] due to its foreign effective tax rate (*FOREIGN ETR)* of only 2.5 % in 2011. While that rate is based on foreign income and foreign tax expenses only, the overall ETR (*GAAP ETR)* of Apple is 24.2 % and therewith significantly higher. Those examples show that, first, various measures for tax expenditures exist, and second, differences arise between those measures.

The examples demonstrate further that ETRs are common measures to analyze tax expenditures. While the different tax measures mentioned above might result in deviating findings at a first glance, it is important to understand the information content of each of these measures. The purpose of this paper is to describe and point out the differences in various ETR measures. Therefore, I focus on five different ETR measures and clarify the information content of each. The interpretation of the components and the explanations of the impact of tax and accounting legislations on ETRs should help future research in choosing a meaningful ETR and establishing an efficient research model. The study aims to raise sensitivity to interpretations

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[8] Dittmer (2011) compares the results of four studies analyzing the ETRs of US firms and finds an ETR of non-US firms that is on average 7.2 percentage points lower than the ETR of US firms.

[9] *Huffington Post* (17/04/2012), available at https://www.huffingtonpost.com/2012/04/17/apple-corporate-income-tax-rate_n_1429955.html.

[10] *New York Times* (21/05/2013), available at http://www.nytimes.com/2013/05/22/technology/ceo-denies-that-apple-is-avoiding-taxes.html.

made based on a single ETR measure, as those in the examples of Apple and Amazon demonstrated above.

To illustrate the differences between various ETR measures, I calculate and compare each measure for US and European firms. While there is a disagreement over who pays more taxes, the result of my comparisons suggests that conflicting findings of prior analyses can be attributed to the use of different ETR measures. US firms face higher *GAAP ETRs* than European firms do, as the *GAAP ETR* includes deferred tax expenses and these are on average higher for US firms. However, comparisons of ETRs based on current tax expenses (*CURRENT ETR)* or cash taxes paid (*CASH ETR* or *CASH ETR5)* result in lower ETRs for US firms. Comparing an ETR measure that focuses on foreign tax expenses and foreign pre-tax income only, i.e., *FOREIGN ETR,* also suggests a lower ratio for US firms. Comparing not only ETR measures between US and European firms but also between various subsamples demonstrates that US multinationals face lower tax expenditures than do purely domestic firms, while the difference between European multinationals and domestic firms is not notable.

Furthermore, I conduct a case study to give specific examples for the differences between several ETR measures. For this, I focus on three US firms and one European firm. Additional information on the income tax accounting from the notes to the financial statements confirms prior assumptions and thus helps to understand the impact on ETRs. Examples of the selected US firms support the importance of deferred tax expenses and demonstrate that ETRs are affected by classification choices on undistributed foreign earnings. For instance, a lower *GAAP ETR* and a similar *CURRENT ETR* result if a firm classifies its undistributed foreign earnings as permanently reinvested outside the US and thus does not recognize deferred tax liabilities. Analyzing the notes to the consolidated statements suggests further that the *CASH ETRs* of the selected US firms are particularly low due to specific accounting principles on employee stock options. In contrast, the notes to the income taxes of the selected European firm

demonstrate that its ETRs are not affected by classification choices and do not indicate a particular importance of employee stock options.

My paper contributes to the existing literature in several ways. First, earlier literature illustrates the compositions and implications of different ETR measures (e.g., Hanlon and Heitzman, 2010), book-tax differences (e.g., Lisowsky, Robinson, and Schmidt, 2013), and unrecognized tax benefits (e.g., Lee, Dobiyanski, and Minton, 2015) as proxies for tax avoidance. Dyreng, Hanlon, and Maydew (2008) developed a long-run *CASH ETR* to measure tax avoidance over several years. Further, different measures of taxes are used as proxies to analyze the determinants of tax expenditures (Gupta, Laux, and Lynch, 2016; Armstrong, Blouin, and Larcker, 2012; Cheng, Huang, Li, and Stanfield, 2012; Chen, Chen, Cheng, and Shevlin, 2010; Collins and Shackelford, 2003; Rego, 2003; Plesko, 2003).

Second, my analyses contribute to research that is struggling with defining tax aggressiveness. While ETRs are common proxies when analyzing tax avoidance, Blouin (2014) discusses the concepts of measuring tax aggressiveness and concludes that ETRs are imperfect measures to capture aggressive tax planning activities. In line with that statement, Hanlon and Heitzman (2010) point out that the definition of aggressive tax behavior is in the "*eyes of the beholder*". While ETRs are one of the most common measures used in empirical analyses, my paper improves the understanding of the information content of different ETR measures and sensitizes for their suitability for measuring tax aggressiveness.

Third, my paper analyzes why research comparing tax expenditures between US and non-US firms comes to conflicting results. While PricewaterhouseCoopers (2011) suggests higher *GAAP ETRs* for US firms than for European firms, Avi-Yonah and Lahav (2012) find lower *CURRENT ETRs* for US firms. Lower *CASH ETRs* for US firms than for firms from Australia, France, Germany and the UK are found by Markle and Shackelford (2012). My study supports the interpretation of empirical results and helps to understand the differences that arise

due to the ETR measure used. Moreover, my analyses expand prior comparisons by considering the long-run *CASH ETR5* and the *FOREIGN ETR* as additional measures for tax expenditures.

Fourth, my paper discusses potential influences arising from the recent US tax reform. The US statutory tax rate was reduced from 35 % to 21 % and the worldwide tax system was replaced by a territorial one in the beginning of 2018 to "*eliminate a source of competitive disadvantage for US companies*"[11]. With regard to the firms selected for my case study, I discuss the impact of the US tax reform on their ETRs.

The remainder of the paper is organized as follows. In the next section, I review the definitions of different ETR measures and describe the institutional background. The sample selection and analytical results regarding the differences in ETRs between US and European firms are described in section 2.3. A case study is implemented in section 2.4. Section 2.5 concludes.

2.2 Theoretical Background and Prior Literature

2.2.1 Alternative Measures of Tax Expenditures

A number of measures are used to analyze tax expenditures. Thereby, the information content of each measure is crucial to know. As ETRs are common measures used in empirical analyses, I focus on *(i) GAAP ETR, (ii) CURRENT ETR, (iii) CASH ETR* and the related long-run *CASH ETR5,* and *(iv) FOREIGN ETR* to compare tax expenditures between US and European firms. With the subsequent descriptions, I clarify the definition of each ETR measure to build a basic understanding for the comparison of ETRs between US and European firms that follows.[12]

[11] *NY Mag* (19/11/2017), available at http://nymag.com/daily/intelligencer/2017/11/how-the-trump-tax-cuts-would-reshape-our-economy.html.

[12] Table A1 of the appendix summarizes the findings. For a detailed variable description, please see table A2 of the appendix.

(i) GAAP ETR

Following ASC 740[13] and IAS 12, the *GAAP ETR* is the ratio of total tax expenses to pre-tax income. Thus, it reflects the average tax rate payable for one unit of financial income (Chen, Dhaliwal, and Trombley, 2012; Dyreng, Hanlon, and Maydew, 2010; Frank, Lynch, and Rego, 2009; Gupta and Newberry, 1997). Firms preparing their financial statements under US GAAP or IFRS are required to disclose this ratio in their notes, and thus, the *GAAP ETR* has several functions. As a reporting tool, the *GAAP ETR* should inform the stakeholders of the financial statements about the amounts, timing and uncertainty of future tax outcome (Demeré, Lisowsky, Li, and Snyder, 2017).

GAAP ETR is calculated on an accrual basis and thus does not reflect the tax liability (or refund) arising from the current period's tax return (Blouin, 2014). The numerator consists of the sum of current and deferred tax expenses. While current tax expenses (should) reflect tax expenses payable for the current period,[14] deferred tax expenses represent future tax payments resulting from reversals of temporary book-tax differences. Tax planning strategies that defer tax payments to future periods (e.g., a more rapid depreciation for tax purposes) lead to a decrease in current tax expenses and a corresponding increase in deferred tax expenses. Thus, deferred tax planning strategies do not affect the *GAAP ETR*, while the ratio is affected by tax planning strategies that result in a permanent benefit (Dyreng, Hanlon, and Maydew, 2008). Permanent book-tax differences do not cause deferred tax expenses and solely lead to a decrease in current tax expenses (Hanlon and Heitzman, 2010). For example, dividends are tax exempted in certain countries and thus, result in a permanent difference that would lower the firm's *GAAP ETR* in the year the dividend is received.

[13] Formerly known as SFAS 109 "Accounting for Income Taxes".

[14] That current taxes do not necessarily reflect the current tax liability will be discussed below when explaining the information content of the *CURRENT ETR*.

Previous literature (Badertscher, Katz, Rego, and Wilson, 2017; Salih, Sheikh Obid, and Annuar, 2013) differentiates between conforming and nonconforming tax avoidance. The deductibility of interests is an example of a conforming tax strategy, as it reduces the taxable and the financial income. In contrast, a lower statutory tax rate in the subsidiary's country of residence is seen as a nonconforming tax strategy, as the lower tax rate reduces only the taxable income, whereas the financial (pre-tax) income is not affected. While the nominator of the *GAAP ETR* is related to taxable income, the denominator (pre-tax income) reflects the financial income. For this reason, the *GAAP ETR* is affected only by nonconforming tax strategies, while conforming tax strategies reduce the nominator and denominator and thus have no impact on the *GAAP ETR* (Badertscher, Katz, Rego, and Wilson, 2017).

The accrual basis might further cause variations in the *GAAP ETR* that are unrelated to tax planning activities. For example, changes in the tax contingency reserve or changes in the valuation allowance affect current or deferred tax expenses. However, those changes have no impact on pre-tax income and thus influence the *GAAP ETR* even if no (obvious) tax planning strategies were pursued (Dyreng, Hanlon, and Maydew, 2008).

As a ratio, the *GAAP ETR* involves the issue of difficulties related to the interpretation of negative values. The ratio becomes negative if either the tax revenues exceed the tax expenses or the firm is making a loss, and thus, the pre-tax income becomes negative. In both scenarios, the informative value of the *GAAP ETR* is difficult to interpret. Interpretations should further be made carefully when a positive *GAAP ETR* arises from a negative nominator and a negative denominator. For these reasons, observations with a negative pre-tax income or negative tax expenses are usually not considered in analyses (Henry and Sansing, 2014).

(ii) CURRENT ETR

CURRENT ETR is defined as current tax expenses divided by pre-tax income (Hope, Ma, and Thomas, 2013; Chen, Dhaliwal, and Trombley, 2012; Hanlon and Shevlin, 2002).

Deviating from the *GAAP ETR,* the numerator of the *CURRENT ETR* does not include deferred tax expenses. *CURRENT ETR* is thereby affected by deferral tax strategies, as a reduction in current tax expenses is not compensated by a corresponding increase in deferred tax expenses in the numerator. All other issues discussed in context with the *GAAP ETR* are also valid for the *CURRENT ETR,* as the *CURRENT ETR* is also based on accruals and builds a ratio of taxable and financial data (Salih, Sheikh Obid, and Annuar, 2013).

However, Hanlon (2003) explains that current tax expenses are not a perfect approximation of current tax liabilities arising from a firm's tax return. For example, she points out that employee stock options under US GAAP result in an overstatement of current tax expenses.[15] Further typical examples for over- or understatements of current tax liabilities are specific accounting legislation for tax cushions and intra period tax allocation (e.g., McGill and Outslay, 2004; Gleason and Mills, 2002).

(iii) *CASH ETR* and *CASH ETR5*

CASH ETR is the ratio of cash taxes paid to pre-tax income (Lennox, Lisowsky, and Pittman, 2013). Cash taxes paid are payments made in the current period and are usually reported in the cash flow statement. The *CASH ETR* reflects the taxes paid for one unit of financial income (Lee, Dobiyanski, and Minton, 2015; Chen, Chen, Cheng, and Shevlin, 2010). Like the *GAAP ETR* and the *CURRENT ETR,* the *CASH ETR* does not capture conforming tax avoidance, as pre-tax income still composes the denominator (Hanlon and Heitzman, 2010).

The major difference compared to the previously discussed ETR measures is that the nominator of the *CASH ETR* is based on a payment instead of an accrual basis. This leads to some different informative values of the *CASH ETR* compared to the *GAAP ETR* and the *CURERNT ETR*: first, the *CASH ETR* does not explicitly reflect taxes accrued in the current

[15] Hanlon (2003) describes in detail how employee stock options do not result in expenses for accounting purposes while deductions are entitled for tax purposes. Another example is given by Edwards, Graham, Lang, and Shackelford (2012).

period. Instead, tax payments accrued in prior periods (e.g., subsequent payments after an IRS audit) or advance tax payments increase the ratio. The potential timing mismatch of nominator and denominator might result in a distorting *CASH ETR*. For example, the use of a loss carry forward can reduce the *CASH ETR* towards zero, even if a financial profit is reported. Second, unlike the *GAAP ETR* and the *CURRENT ETR,* the *CASH ETR* is not affected by changes in the tax contingency reserve or in the valuation allowance, as these affect solely the current or deferred tax expenses and not the cash taxes paid (Dyreng, Hanlon, and Maydew, 2008).

Furthermore, the *CASH ETR* does not suffer from an overstated numerator as, for example, caused by employee stock options (Gebhart, 2017). However, regarding the *CASH ETR*, another inconsistency arises with stock-based compensations: while the exercise of employee stock options reduces the tax payments in the respective year, a record of related stock options expenses and tax benefits is not required.[16] Thus, the pre-tax income is not affected when options are exercised and typically overstated. The *CASH ETR* decreases as the numerator of the *CASH ETR* is reduced due to the tax deduction, while pre-tax income remains unchanged (Edwards, Graham, Lang, and Shackelford, 2012).

The *CASH ETR* is in particular criticized for the timing mismatch. Thus, Dyreng, Hanlon, and Maydew (2008) developed a long-run *CASH ETR* to overcome this shortcoming. The *CASH ETR5* sets a ratio of the sum of cash taxes paid over five years and the sum of pre-tax income over the same period. The long-run *CASH ETR* can also be calculated for a longer period (e.g., Dyreng, Hanlon, and Maydew, 2008 analyze the *CASH ETR10*, which is measured over ten years). The long-run *CASH ETR* has in particular three properties (De Waegenaere, Sansing, and Wielhouwer, 2015; Dyreng, Hanlon, and Maydew, 2008). First, a potential timing mismatch between the nominator and denominator becomes less material. Second, a potential

[16] Instead, those tax benefits were added to equity without affecting net income.

overweight of extremely large or small effective tax rates is mitigated over time. Third, loss-making years will not necessarily be excluded.

(iv) FOREIGN ETR

FOREIGN ETR is defined as foreign tax expenses divided by foreign pre-tax income (Hope, Ma, and Thomas, 2013). It reflects the average foreign tax rate payable for one unit of foreign financial income. Unlike the three other ETRs presented above, the *FOREIGN ETR* does not consider the worldwide activities of a firm. Instead, it focuses on foreign activities and the related tax expenses, while tax expenses related to the respective home country are excluded. In addition to this difference, the *FOREIGN ETR* is comparable to the *GAAP ETR*.

2.2.2 Conceptual Framework of Foreign Earnings

The explanations above demonstrate that tax and accounting legislation, as for example the recognition of deferred taxes, have (different) impacts on ETR measures. Thus, it is important to understand the differences arising from tax and accounting legislations when comparing ETR measures between US and European firms. In particular, tax and accounting legislations regarding foreign earnings differ between the US and most European countries prior to the US tax reform in 2017.

Until 2017, the worldwide tax system was applicable in the US. Thereby, foreign earnings were taxed in the US when repatriated. While taxes already paid in foreign countries could be credited on the US tax liability, foreign tax rate differentials granted only a temporary liquidity advantage for US firms, as the difference between the lower foreign tax rate and the higher US tax rate had to be paid when foreign earnings were repatriated. Those temporary differences were recognized as deferred tax liabilities. However, under US GAAP, permanent differences were considered when undistributed foreign earnings were intended to be indefinitely reinvested outside the US. In that case, no deferred tax liabilities were recognized

and a lower *GAAP ETR* were reported because the differences would not reverse over time (Baumann and Schadewald, 2001).

In contrast to the worldwide tax system in the US, all European countries except Ireland have implemented a territorial tax system.[17] Under the territorial tax system, foreign earnings are excluded from taxation when repatriated. As a consequence, tax rate differentials result in permanent differences and thus do not cause the recognition of deferred tax liabilities. However, with the tax reform in 2017 the US switched from the worldwide tax system to the territorial tax system and thus, became more comparable to most European countries.

2.2.3 Deviating Results of Prior Research

Different ETR measures are used by prior literature that analyzes tax differentials between US and European firms. Taking into account that *GAAP ETR* is based on accruals and in particular reflects permanent and nonconforming tax planning strategies, it is a common measure to compare tax expenses. Studies investigating the differences in tax expenses between US and European firms suggest that *GAAP ETRs* of US firms are higher than the *GAAP ETRs* of European firms. For example, a study of PricewaterhouseCoopers (2011) analyzes the Forbes Global 2000 list and finds a 5.8 percentage points difference between the *GAAP ETRs* of US and European firms in the period from 2006 to 2009.

As discussed above, the *CURRENT ETR* should preferably be used compared to the *GAAP ETR* when research is interested in deferral tax strategies. In contrast to the comparisons of *GAAP ETRs* between US and European firms, prior research finds a lower *CURRENT ETR* for US firms. Avi-Yonah and Lahav (2012) suggest a 4.0 percentage points lower *CURRENT ETR* for the largest US firms during the period from 2001 to 2010.

[17] See further worldwide corporate tax summaries of PwC, KPMG, and EY.

While research analyzing the *CASH ETR* and the long-run *CASH ETR5* has increased over the last years, a detailed analysis of the differences between US and European firms' *CASH ETRs* does not exist so far to the best of my knowledge. However, Markle and Shackelford (2012) compare the *CASH ETR* between US firms and firms from Australia, France, Germany, and the UK in the period from 1988 to 2009 and suggest a lower one for US firms. Swenson and Lee (2008) confirm a lower *CASH ETR* for US firms than for non-US firms in 2006 and 2007. However, empirical evidence regarding the differences in the long-run *CASH ETR* between US and European firms is still rare.

Furthermore, research that compares the *FOREIGN ETR* over different countries is scarce. A comparable analysis over different countries is complicated due to the rareness of data. While US firms are required to report foreign tax expenses and foreign pre-tax income, most other accounting standard setters worldwide do not require reporting foreign tax expenses and foreign pre-tax income.

Concluding, higher tax expenditures in terms of *GAAP ETR* are found for US firms compared to European firms while comparisons regarding the *CURRENT ETR* or *CASH ETR* suggest lower tax expenditures for US firms.[18] As most previous studies focus on a single ETR measure only and each study considers a different sample or approach, it is not clear whether deviating results can be attributed to the use of different ETR measures. Therefore, the following comparisons of tax expenditures between US and European firms consider all ETR measures presented above. Furthermore, the analyses demonstrate the importance of differences in tax and accounting legislations when comparing tax expenditures between US and European firms.

[18] The more detailed analyses of tax differentials between US and European firms that follows in chapter 3 of this thesis confirm the findings regarding different ETR measures. The analyses of chapter 3 are based on a matched sample of firms listed on the S&P500 and StoxxEurope600 stock market indices.

2.3 Differences in ETRs between US and European Firms

2.3.1 Sample Selection

In order to conduct my analyses, I require consolidated financial information of US and European firms. To maximize the number of observations, I impose only a minimum of requirements on my sample. I select firms from *Compustat* and *Compustat Global* that are incorporated in the US or Europe during the years 2011 through 2015. Then, I require non-missing financial information to calculate *GAAP ETR*, *CURRENT ETR* and *CASH ETR* in order to conduct a comparison between different ETRs. However, I do not require non-missing financial information to calculate *FOREIGN ETR,* as this restriction would drop all domestic firms from my sample. I exclude countries with less than 100 observations over the considered five year period to mitigate a potential bias arising from countries with a limited data coverage.

I define *GAAP ETR* in line with ASC 740 as tax expenses divided by pre-tax income. I adjust the latter for extraordinary items.[19] *CURRENT ETR* is defined as current tax expenses divided by pre-tax income, and *CASH ETR* is calculated as taxes paid divided by pre-tax income.[20] *CASH ETR5* is defined as the sum of cash taxes paid of the last five years divided by the sum of the pre-tax income derived over the same period. I exclude observations if the numerator or denominator of the ETR is negative and generally exclude ETRs with values greater than one. These requirements reduce my sample to 3,456 US and 2,826 European firms.[21]

For US MNCs, *FOREIGN ETR* is defined as foreign taxes divided by foreign pre-tax income. As European firms usually do not report foreign taxes and foreign pre-tax income in

[19] Please refer to table A2 of the appendix for a detailed variable description.

[20] While it is common in previous literature to adjust the pre-tax income by extraordinary items when computing the *GAAP ETR*, the adjustment is usually not made for other ETR measures. However, the results of the following analyses stay constant when computing the *CURRENT ETR* and *CASH ETR* considering the adjusted pre-tax income.

[21] Please refer to table A3 of the appendix for a detailed sample selection.

their consolidated financial statements, I follow the same approach as in chapter 3 of this thesis to calculate the *FOREIGN ETR* of European MNCs. Thereby, I approximate the foreign variables by subtracting domestic taxes and domestic pre-tax income from the overall tax expenses and the overall pre-tax income. The domestic information is obtained by combining ownership information with micro level financial information from the *Amadeus* database, which is provided by Bureau van Dijk. The domestic taxes (pre-tax income) of a European MNC are thereby calculated by summing up the tax expenses (pre-tax income) reported in the financial statements of all domestic subsidiaries. This approximation enables the comparison of 1,417 US and 466 European firms with regard to the *FOREIGN ETR*.[22]

2.3.2 Univariate Analyses

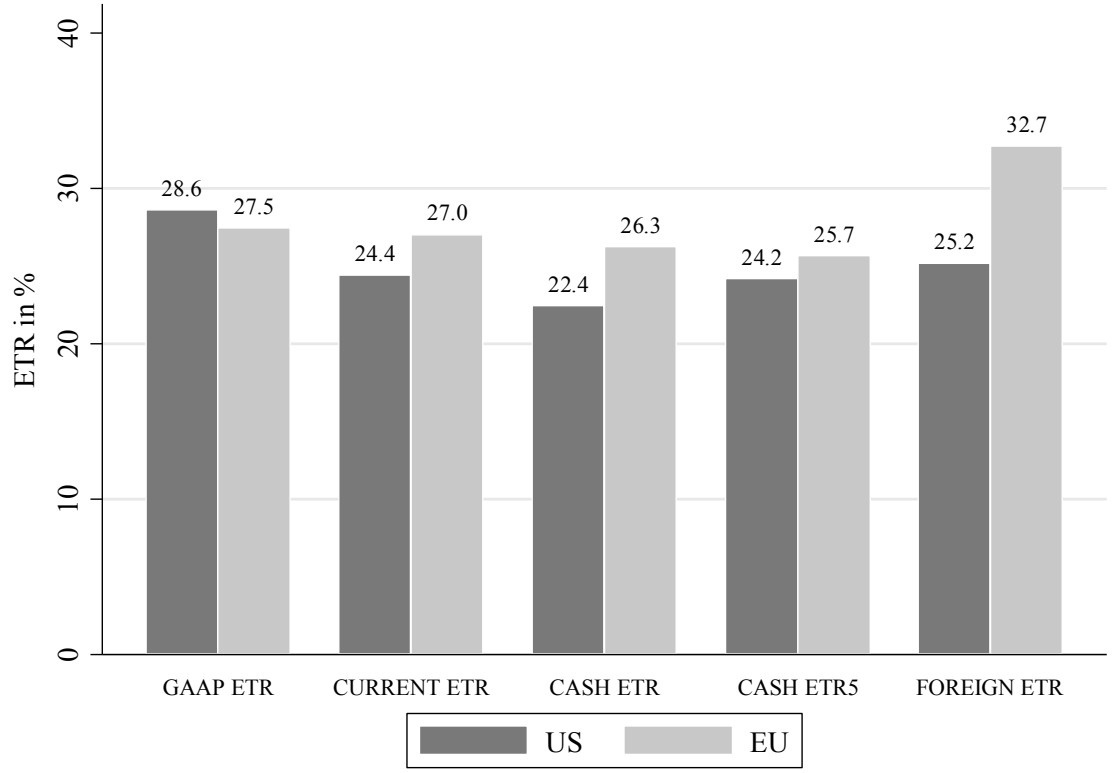
In the following analyses, I compare the average of five ETR measures between US and European firms. Thereby, I illustrate differences that arise between varying ETR measures. I continue with demonstrating differences between the US and several European countries and between different subsamples and illustrate the changes in ETRs arising over time.

(i) Differences between ETRs

Based on the ETR definitions and the sample selection described in section 2.2.1 and 2.3.1, the following figure demonstrates the mean values of alternative ETR measures for US and European firms.

[22] An example of how the *FOREIGN ETR* is calculated is given within the variable description in table A2 of the appendix. Table A3 of chapter 3 of this thesis (page 117) provides a more detailed example of calculation.

Figure 1. Alternative ETRs



Notes: The figure compares the averages of alternative ETRs between US and European firms. The sample is based on the years from 2011 through 2015. ETRs are defined in table A2 of the appendix.

Figure 1 shows that US firms report a *GAAP ETR* that is 1.1 percentage points higher than that of European firms. As a statutory tax rate of 35 % is applicable in the US,[23] the *GAAP ETR* of 28.6 % of US firms demonstrates that permanent differences reduce the tax expenses of US firms by 6.4 percentage points. In contrast, the average statutory tax rate of the European sample is 27.3 %.[24] The slightly higher *GAAP ETR* of 27.5 % indicates that permanent differences increase the tax expenses of European firms. Thus, the higher *GAAP ETR* of US firms does not imply that they are less involved in tax planning strategies than European firms

[23] The statutory tax rate of 35 % is applicable during the considered time period from 2011 to 2015 and refers only to the statutory tax rate. Thus, it does not consider state and local taxes. The average combined statutory tax rate for the considered sample period is approximately 39 %. As the ETR reconciliation in the notes to income taxes of US firms typically refers to the statutory tax rate of 35 %, I will also concentrate on this rate.

[24] The statutory tax rates were collected from the worldwide corporate tax summaries of PwC, KPMG, and EY. Please refer to the descriptive statistics of this sample in table A4 of the appendix.

are. This finding leads to an important conclusion: it is important to know the statutory tax rate of the home country when interpreting the *GAAP ETR.*[25]

Regarding the other four measures, figure 1 demonstrates lower ETRs for US firms than for European firms. While the *CURRENT ETR* of European firms is very similar to their *GAAP ETR*, US firms report on average a *CURRENT ETR* that is 14.7 % (4.2 percentage points) lower than their *GAAP ETR*. This implies that US firms recognize higher deferred tax expenses and thus are more involved in tax deferral strategies.[26]

US firms also report a lower *CASH ETR* than European firms do. Notably, the difference between the cash-related measure (*CASH ETR*) and the accrual-related measure (*CURRENT ETR*) is higher for US firms (difference of 8.2 %) than for European firms (difference of 2.6 %). As US firms usually prepare their financial statements under US GAAP and European firms under IFRS, the finding implies higher deviations between current tax expenses and tax payments when preparing financial statements under US GAAP. As *CASH ETRs* decrease when employee stock options are exercised, and stock-based compensations are more common in the US than in Europe (Boeri, Licifora, and Murphy, 2013), a lower *CASH ETR* of US firms than of European firms seems reasonable. Figure 1 demonstrates further that the *CASH ETR5* of US firms is higher compared to the single-year *CASH ETR*. Dyreng, Hanlon, and Maydew (2008) obtain similar results and conclude that low *CASH ETRs* are not easy to obtain over a longer period of time. However, figure 1 demonstrates that these findings cannot be confirmed for European firms, as their average *CASH ETR5* is slightly smaller than the single-year *CASH ETR*.

[25] In particular for domestic firms the home country statutory tax rate is a suitable benchmark level when analyzing *GAAP ETRs*. Herbert and Overesch (2015) argue that the average statutory tax rates of the home country and all host countries of a firm is a better benchmark level for MNCs. However, the home country statutory tax rate might also be a good starting point for MNCs as usually most of the income is generated, and thus taxable, in the home country of an MNC.

[26] The descriptive statistics in table A4 of the appendix further support this assumption. US firms report an overlap of deferred tax expenses, while European firms recognize on average an overlap on deferred tax earnings.

The tax differential between US and European firms is particularly high regarding the *FOREIGN ETR:* US firms face a *FOREIGN ETR* that is 7.5 percentage points lower than that of European firms. While the *FOREIGN ETR* is lower than the *GAAP ETR* of US firms, figure 1 demonstrates the opposite for European firms. It is plausible to find foreign tax expenses lower than the overall tax expenses for US firms, as during the considered sample period, the US statutory tax rate is the highest in a worldwide comparison, and thus, foreign activities will usually be taxed at a lower foreign tax rate. Further, the higher *FOREIGN ETR* for European firms can be explained by foreign statutory tax rates that are on average higher than the applicable statutory tax rate in the respective home country. For example, the US activities of a UK firm are taxed at the higher US tax rate and thus lead to higher foreign tax expenses, while the applicable statutory tax rate in the home country is only 20 %.[27]

All in all, my comparisons are in line with prior findings, as they suggest higher *GAAP ETRs* and lower *CURRENT ETRs* for US firms than for European firms. Furthermore, my findings expand prior comparisons by using additional ETR measures and suggest lower tax expenditures for US firms compared to European firms in terms of *CASH ETR*, *CASH ETR5,* and *FOREIGN ETR*, as well.

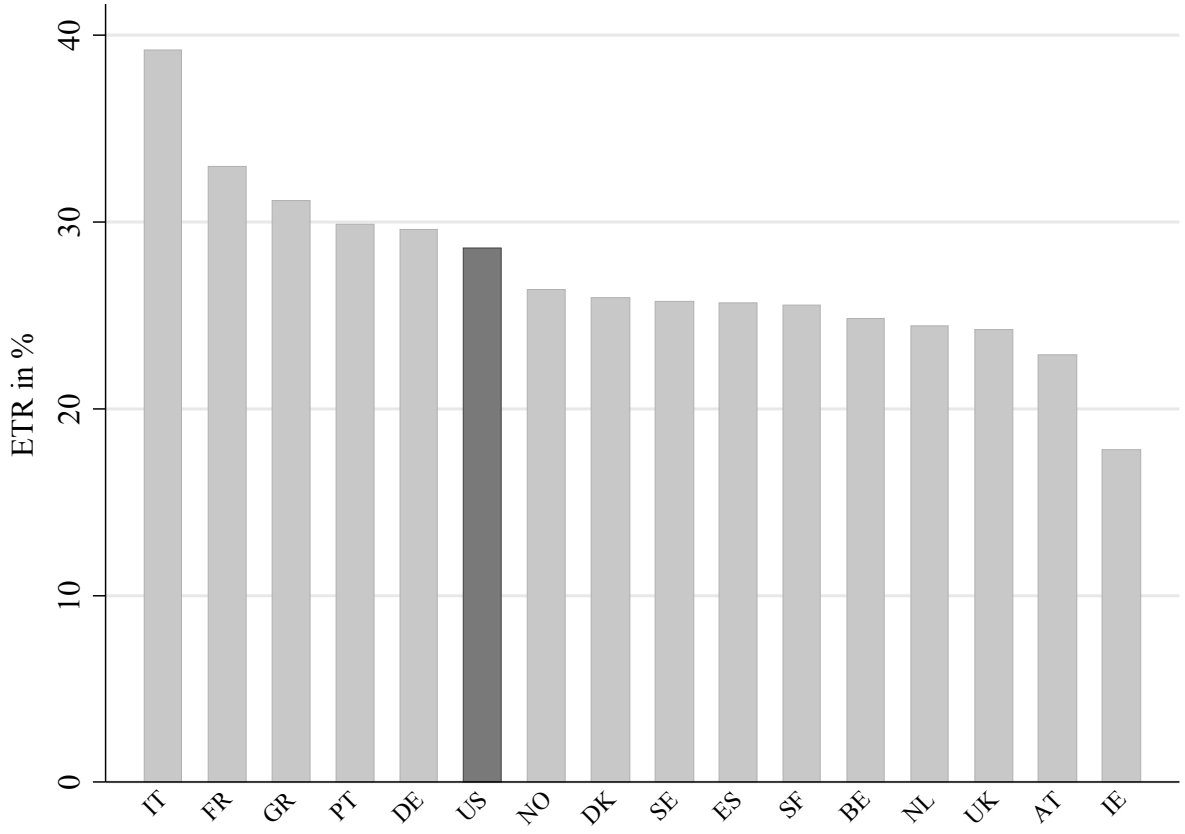
(ii) Differences between Countries

When comparing tax expenditures between US and European firms, tax expenditures from different European countries were combined into one measure. However, the home country of a firm might affect its ETR, as accounting and tax legislations differ across

[27] Note that this finding cannot necessarily be generalized, as the sample size is reduced by approximately 60 % when considering the *FOREIGN ETR*.

countries.[28] To better understand the differences in ETRs between the US and certain European countries, the following figure shows the average *GAAP ETR* for each country.[29]

Figure 2. GAAP ETRs of Different Countries



Notes: The figure shows the average *GAAP ETR* of different countries. The sample is based on the years from 2011 through 2015. *GAAP ETR* is defined in table A2 of the appendix.

Figure 2 demonstrates that US firms have neither extremely high nor extremely low tax expenses compared to other firms headquartered in European countries. Italian firms have the highest average *GAAP ETR* with 39.2 %. While a statutory tax rate of 27.5 % is applicable for Italian firms within the considered sample period, an additional regional tax of 3.9 % on the net value of production applies to manufacturing firms. As the latter is calculated on the net value of production and thus is not related to pre-tax income, the Italian *GAAP ETR* is difficult to

[28] While each European country has its national accounting rules, all listed European firms prepare their consolidated statements in line with IFRS and are thus subject to uniform accounting rules. However, my sample also considers firms that are not listed and thus prepare their consolidated statements in line with the respective national GAAP.

[29] For presentational purposes, I will focus on *GAAP ETRs* in the following. However, all analyses are also conducted with the other ETR measures and are presented in the appendix.

interpret (Beuselinck and Pierk, 2018; Jaafar and Thornton, 2015). The lowest *GAAP ETR* is found for firms located in Ireland. This finding might be explained by the low statutory tax rate (12.5 %) applicable in Ireland.[30]

Figure A1 of the appendix demonstrates the difference between the countries with regard to the other ETRs. It shows that US firms report the second lowest *CASH ETR* within the comparison of different countries. Moreover, irrespective of the ETR measure, Italian firms always have the highest ETR, while the ETRs of Irish firms are always quite low compared to other countries.

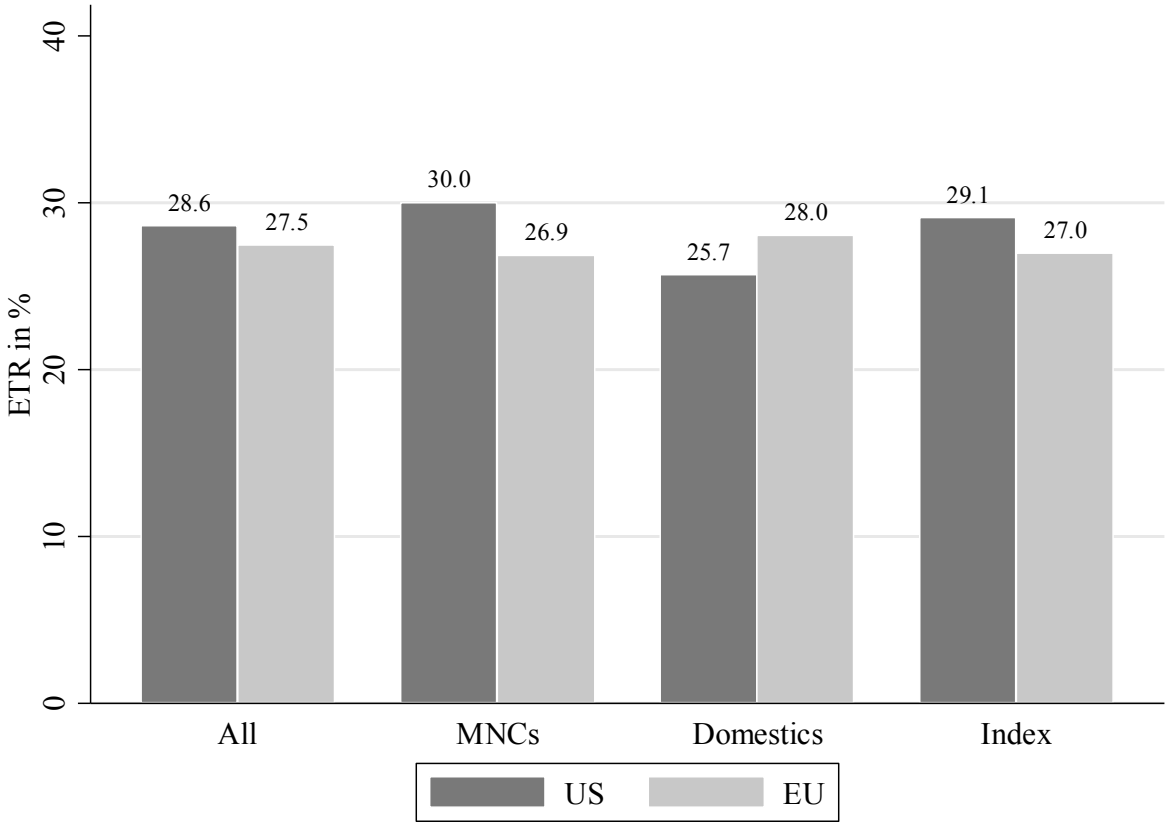
(iii) Differences between Subsamples

I continue with splitting the sample into different groups to examine whether the results vary within specific subsamples. I differentiate between multinational (MNCs) and domestic firms. In line with prior literature, I define a firm to be multinational either if its foreign pre-tax income is greater than zero (Dyreng, Hanlon, Maydew, and Thornock, 2017) or if it has at least one majority-owned subsidiary located in a foreign country (Huizinga and Laeven, 2008). Firms that do not fulfill one of these requirements are then considered domestic. Another additional subsample includes firms that are listed on the S&P500 or StoxxEurope600 stock market indices. While my analyses compare the average ETRs only and thus do not look for differences in firm-specific characteristics, this subsample concentrates on US and European firms that should have at least some comparable characteristics (e.g., legal structure and firm size). Further, European firms that are listed on the stock market indices are required to prepare their consolidated financial statements in line with IFRS. Thus, the ETRs of those European firms are based on financial data prepared under the same accounting principles.[31]

[30] As mentioned above, Ireland is the only European country where the worldwide tax system is implemented. However, additional taxes on the repatriation of foreign income might not be substantial because Ireland has one of the lowest statutory tax rates in a worldwide comparison.

[31] While IFRS is obligatory for European firms listed on stock market indices, other firms can choose the accounting rules specific to their home country to prepare their consolidated statements.

Figure 3. GAAP ETRs of Subsamples



Notes: The figure compares the average *GAAP ETR* between different subsamples of US and European firms. The sample is based on the years from 2011 through 2015. The first two bars (All) include all observations. A firm is considered as multinational (MNCs) if it has at least one foreign subsidiary or its foreign pre-tax income is greater than zero, all other firms are considered domestic (Domestics). The last two bars (Index) consider firms that are listed on the S&P500 or StoxxEurope600 stock market indices. The *GAAP ETR* is defined in table A2 of the appendix.

Figure 3 shows the differences in *GAAP ETRs* between the different subsamples. In line with the prior finding of higher *GAAP ETRs* for US firms, US MNCs and the US firms listed on the stock market indices report also higher *GAAP ETRs* than do European firms. However, lower *GAAP ETRs* are found for purely domestic US firms and not for purely domestic European firms. This finding is particularly surprising, as US domestic firms face on average a higher statutory tax rate than do European domestic firms.

Some remarks can further be given on differences arising within US or European subsamples. Comparing the *GAAP ETR* between European MNCs and European domestic firms, my results suggest lower tax expenses for MNCs. This result seems to be reasonable, as MNCs face permanent differences due to lower foreign tax rates, while those permanent

differences do not exist for domestic firms and thus do not affect their *GAAP ETR*.[32] In contrast, US domestic firms report on average lower *GAAP ETRs* than do US MNCs. This implies that US domestics firms face either higher permanent differences or lower deferred tax liabilities than do MNCs. The latter possibility is more reasonable, as in contrast to domestic firms, US MNCs have to recognize deferred tax liabilities for the foreign tax rate differential related to undistributed foreign earnings (if they are not intended for reinvestment indefinitely).

Figure A2 of the appendix shows the differences between the US and European subsamples with regard to the *CURRENT ETR, CASH ETR, CASH ETR5,* and *FOREIGN ETR.* The figure demonstrates that in line with my basic results, the considered ETRs are lower for US firms than for the respective European subsample.[33] It further shows that US domestic firms report in general lower ETRs than do US MNCs.[34] The difference between the *GAAP ETR* and the *CURRENT ETR* demonstrates that deferred tax strategies reduce tax expenses by 24.3 % (6.3 percentage points) for US domestic firms and 10.5 % (3.2 percentage points) for US MNCs. These findings suggest that differences exist not only between US and European tax expenditures but also between US MNCs and US domestic firms.[35] In contrast, the differences in ETRs between European MNCs and European domestics firms are quite small.

(iv) Differences over Time

While the previous comparisons are based on the recent years of 2011 through 2015, it is also interesting to determine whether the differences between US and European firms already

[32] This finding indicates that foreign activities reduce the overall tax expenses due to foreign tax rate differentials. This conclusion might be in contrast to the prior finding that European firms face a higher *FOREIGN ETR* than *GAAP ETR.* Those divergent results may arise due to the sample composition: the sample size is reduced by approximately 60 % when *FOREIGN ETR* is considered. However, more specific research is needed to understand these puzzling results.

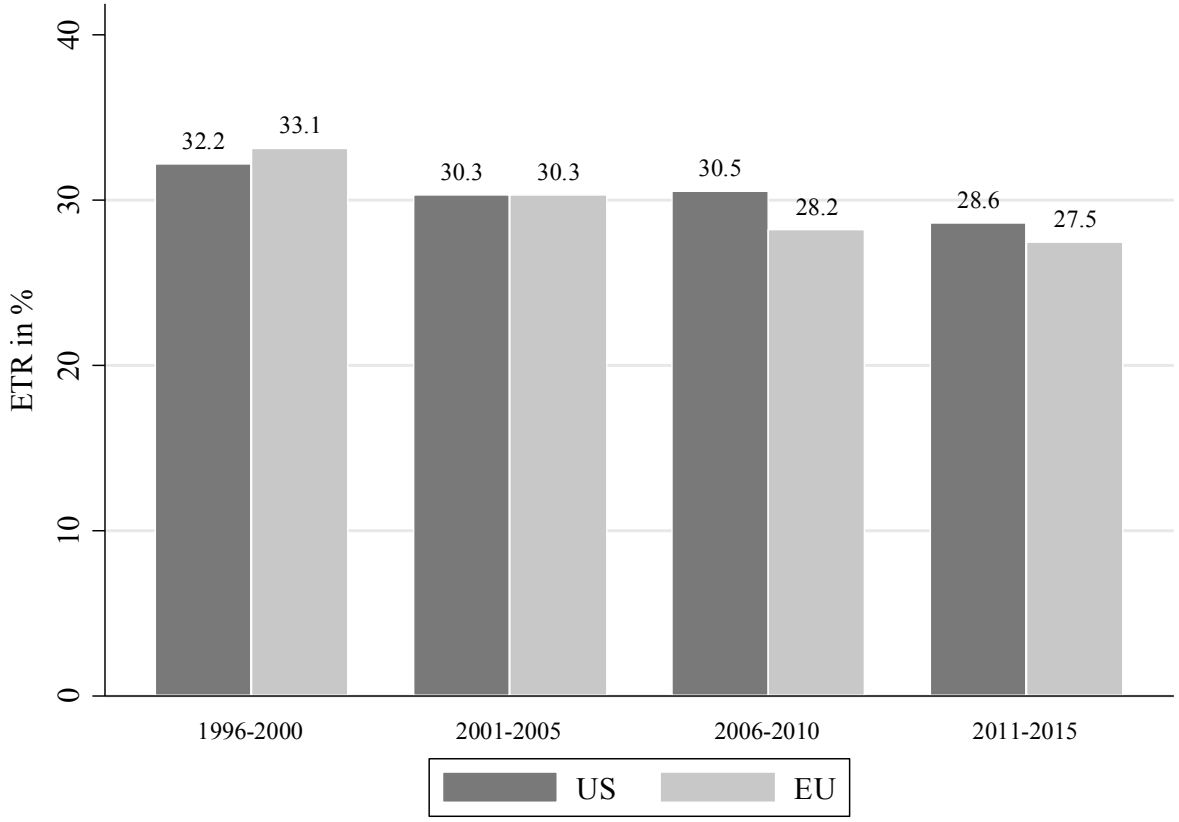
[33] Only with regard to the *CASH ETR5* US MNCs report a slightly higher rate than do European MNCs.

[34] Please note that the *FOREIGN ETR* cannot be calculated for domestic firms.

[35] Dyreng, Hanlon, Maydew, and Thornock (2017) also note that US domestic firms are not disadvantaged compared to US MNCs. However, little is known about how US domestic firms compensate for the disadvantage arising from not having access to international tax avoidance strategies as US MNCs have.

existed in prior years. To understand the time trend in ETRs, the following figure demonstrates that the differences in US and European firms' *GAAP ETR* have risen over time.

Figure 4. Development of GAAP ETR over Time



Notes: The figure compares the development in the average *GAAP ETR* between US and European firms. The sample is based on the years from 1996 through 2015. The *GAAP ETR* is defined in table A2 of the appendix.

First, it is notable that the *GAAP ETR* decreased for US and European firms.[36] The average *GAAP ETR* of US (European) firms was 32.2 % (33.1 %) from 1996 to 2000 and decreased by 3.6 (5.6) percentage points within the following fifteen years. A general decline in statutory tax rates (Dyreng, Hanlon, Maydew, and Thornock, 2017) and changes in tax legislations can be potential explanations.

Interestingly, a higher *GAAP ETR* for US firms than for European firms is found in the more recent years only. While the average *GAAP ETRs* of US and European firms are very close to each other from 2001 to 2005, a higher average is found for European firms for the

[36] This finding is in line with prior research, e.g., Graham and Tucker (2006).

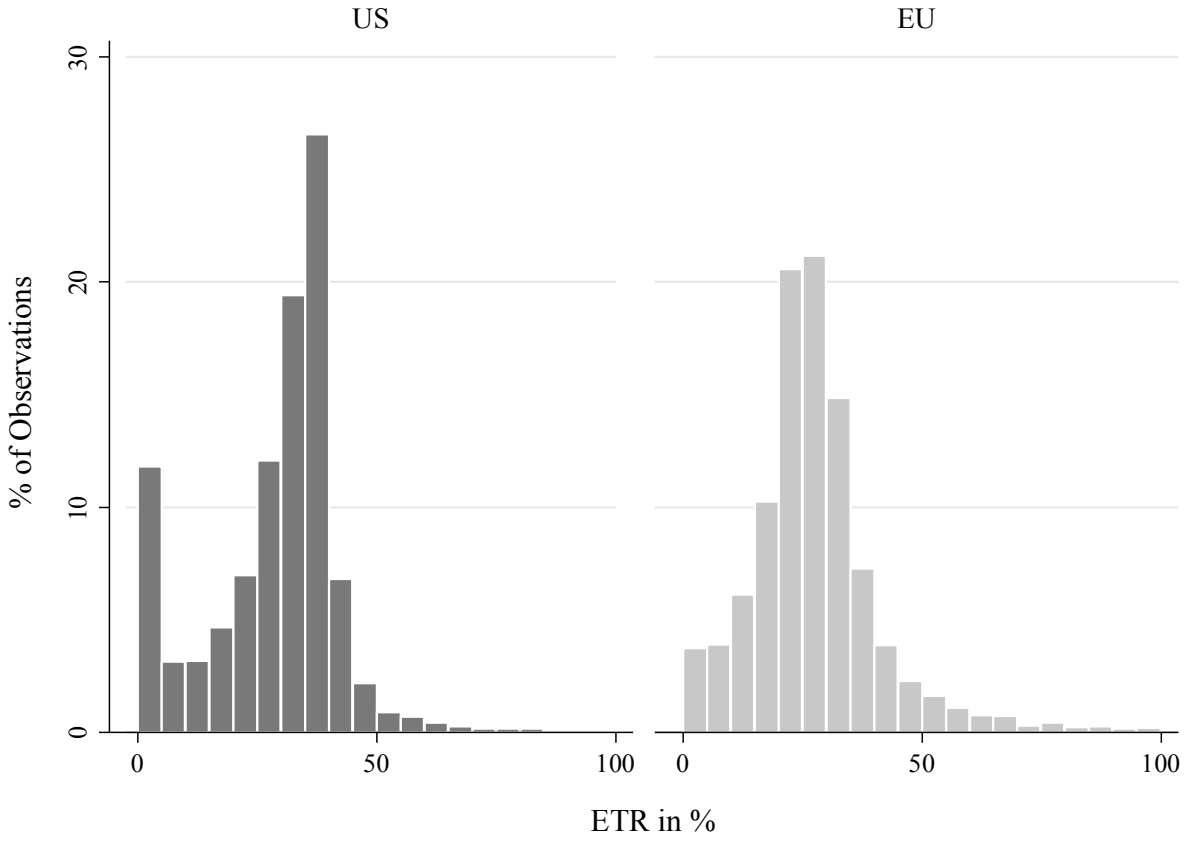
early years from 1996 to 2000. Even if the US tax legislation changed over time, the worldwide tax system and the (high) statutory tax rate were applicable until the last US tax reform in 2017. The combination of both tax legislation characteristics might explain why the *GAAP ETR* of US firms decreased (11.1 %) less than did the *GAAP ETR* of European firms (16.9 %), and thus, US firms have benefited less from a decline in statutory tax rates over the last twenty years. However, further research is necessary to prove this assumption.

Figure A3 of the appendix demonstrates the trend over time for the *CURRENT ETR, CASH ETR, CASH ETR5,* and *FOREIGN ETR* of US and European firms. While all ETRs decreased over time for US and European firms, the *FOREIGN ETR* of European firms increased slightly. Consistent with the prior findings regarding those four ETRs, US firms also report in general lower ETRs than do European firms in earlier years.

2.3.3 Explorative Analyses

While the previous analyses focus on comparisons of the average ETRs between US and European firms, the findings do not inform about differences in the distribution of ETRs. Thus, it is unexplained whether the differences found in ETRs have general implications for the tax expenditures of US and European firms or whether notable differences exist within both groups. To analyze the differences in distributional characteristics of tax expenditures between US and European firms, the following figure presents histograms of the *GAAP ETR* for both samples.

Figure 5. Distribution of GAAP ETR



Notes: The figure compares the distribution of the average *GAAP ETR* between US and European firms. The sample is based on the years from 2011 through 2015. The *GAAP ETR* is defined in table A2 of the appendix.

To construct these histograms, I divide the sample with regard to the *GAAP ETR* into 20 groups. Thus, the first bar on the left of each histogram presents the percentage of observations having a *GAAP ETR* below 5 %, the second bar presents the observations with a *GAAP ETR* between 5 % and 10 %, and so on. While the two fractions with the most observations of European firms belong to a *GAAP ETR* between 20 % and 30 %, the two fractions with the most observations of US firms belong to a *GAAP ETR* between 30 % and 40 %. However, it is clear when looking at figure 5 that more US firms report very low *GAAP ETRs*; the histograms show that 11.8 % of the US observations report a *GAAP ETR* below 5 %, while only 3.7 % of the European observations archive such a low *GAAP ETR*.

This finding is even more pronounced with regard to the *CURRENT ETR* and the *CASH ETR,* as shown by figure A4 in the appendix. It demonstrates that the fraction with the most

observations of US firms belong to a *CURRENT ETR* and *CASH ETR* below 5 %, while the fractions with the most European observations belong to *CURRENT ETR* and *CASH ETR* between 20 % and 30 %. The finding implies that some notable differences exist in the distributions of the respective ETRS between US and European firms. The histograms further suggest that tax payments are unbalanced within the US: for example, more than 21 % of the US firms have a *CASH ETR* below 5 %, while more than 20 % of the US sample has a *CASH ETR* equal to or higher than 35 %.

The distribution of the cash taxes paid tightens when considering the *CASH ETR5* for US and European firms. Figure A4 of the appendix implies further that it is more difficult to maintain low *CASH ETRs* over several years. This finding is in line with the suggestions of Dyreng, Hanlon, and Maydew (2008).

2.4 Clarification of Results – A Case Study Example

2.4.1 Firm Selection and Procedure

While the previous comparisons of ETRs between US and European firms allow a scope of interpretations and possible explanations only, the following case study investigates the raised assumptions using selected examples. Several MNCs, such as Apple, Amazon, and Google, are considered to be engaged in tax sheltering activities due to very low tax payments measured by ETRs.[37] The following case study concentrates on these three US firms to assess the claims. I analyze their ETRs and demonstrate differences that arise in particular from different classification choices on undistributed foreign earnings. To understand those classification choices and additional issues that affect ETRs, I use more specific information

[37] *Reuters* (22/05/2013), available at https://www.reuters.com/article/us-eu-tax-avoidance/factbox-apple-amazon-google-and-tax-avoidance-schemes-idUSBRE94L0GW20130522. For example Senator John McCain criticized Apple "*as among America's largest tax avoiders*", see *New York Times* (21/05/2013), available at http://www.nytimes.com/2013/05/22/technology/ceo-denies-that-apple-is-avoiding-taxes.html.

from the consolidated statements. The case study focuses on the year 2011, as the criticism on low ETRs arose in 2012 and thus is based on the prior year's ETRs.

Analyzing the differences in the ETRs between US and European firms, I further consider the German-based SAP SE (in the following "SAP"). I select SAP as a European firm, as it is comparable to the selected US firms because it is an MNC listed on the New York Stock Exchange. Thus, in addition to meeting IFRS reporting requirements, SAP also meets the reporting requirements of the Security Exchange Commission ("SEC"). This is why SAP reports foreign tax expenses and foreign pre-tax income in its annual report, although it is not required to do so under IFRS. As a consequence, all ETRs can be analyzed with the information from the consolidated statement.[38]

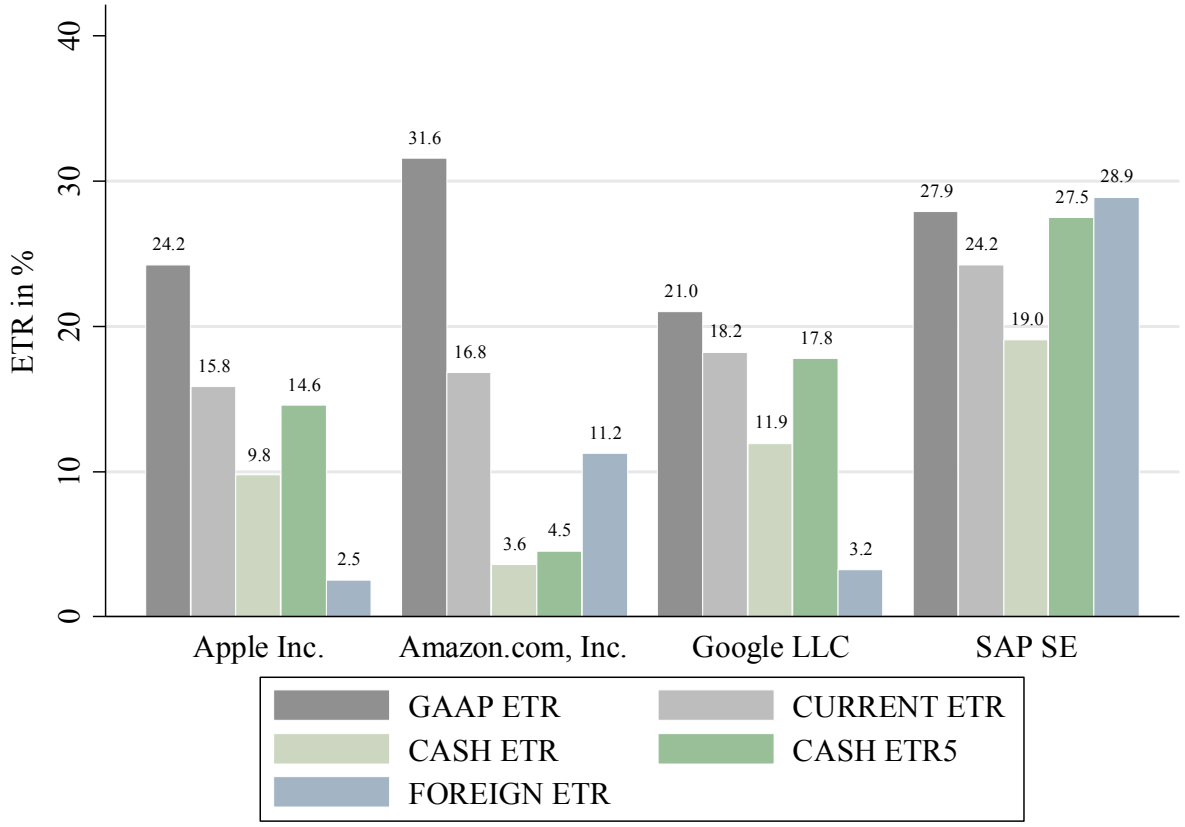
I acknowledge that (as all case study results) the following findings depend on the firms selected for the study. However, I do not intend to make general conclusions based on this case study. Instead, I give examples and explanations for the findings of section 2.3. Thus, I am not concerned about the unbalanced selection of three US firms compared to one European firm. As the recent US tax reform will have an impact on tax expenditures, I will further discuss the potential changes on ETRs. The case study concludes with sensitizing for judgments based on the value of a single ETR.

2.4.2 Differences in the ETRs of Selected Firms

The following figure shows the different ETRs for Apple, Amazon, Google, and SAP in the year 2011.

[38] Please note that *Compustat* and *Compustat Global* collect their data from consolidated statements. Thus, the ETR measures calculated on the *Compustat* databases in section 2.3 can be confirmed and further analyzed with consolidated statement information. As SAP reports its foreign taxes and pre-tax income, the approximated *FOREIGN ETR* of section 2.3 can also be confirmed with the consolidated statement information; the approximated *FOREIGN ETR* differs from the *FOREIGN ETR* calculated on consolidated data information by less than 1 percentage point. For a more precise analysis, I will in the following consider the *FOREIGN ETR* calculated on the consolidated statement information.

Figure 6. Alternative ETRs of Selected Firms



Notes: The figure shows the ETRs of Apple, Amazon, Google, and SAP. The data is based on the year 2011. ETRs are defined in table A2 of the appendix.

Figure 6 shows that, for a given firm, material differences exist between the prior discussed ETRs. Without having further information, three crucial findings can be mentioned for the selected US firms in 2011. First, the *GAAP ETR* is below the US statutory tax rate of 35 % in all three cases. Second, the *CURRENT ETR* is always lower than the *GAAP ETR*. Third, the *CASH ETR* (and *CASH ETR5*) is smaller than the *CURRENT ETR* for all three US firms.

The explanations of ETRs in section 2.2.1 and the notes on income taxes of the consolidated financial statements[39] help in understanding those findings. In accordance with the definition of *GAAP ETR,* the first finding of a downward deviation compared to the US

[39] The consolidated financial statements of Apple, Amazon, and Google are available at https://www.sec.gov. The consolidated financial statements of SAP are available at https://www.sap.com/investors/en/reports/downloadcenter.html.

statutory tax rate implies that the considered US firms are engaged in permanent tax planning strategies. For example, figure 6 shows that permanent tax planning strategies reduce Apple's *GAAP ETR* to 24.2 %. Usually, the ETR reconciliation in the notes to income taxes explains the components of those permanent tax planning strategies. The ETR reconciliation of Apple[40] indicates that permanent differences arise in particular due to lower statutory tax rates applicable to permanently reinvested earnings of foreign subsidiaries. Tax rate differentials between the US and other countries, where earnings of foreign subsidiaries are reinvested permanently, decrease Apple's *GAAP ETR* (total tax expenses) by approximately 11.4 percentage points ($3,898 million).[41] Even if the magnitude differs in total values, the ETR reconciliations of Amazon and Google show that permanent differences also arise in particular due to foreign tax differentials and thus also explain the downward deviation of their *GAAP ETRs* from the US statutory tax rate.[42] These findings suggest that the selected US firms benefit from lower foreign statutory tax rates and explain further why the reported *FOREIGN ETR* is lower than the reported *GAAP ETR* in all three cases.

The second finding mentioned above is attributed to the difference between *GAAP ETR* and *CURRENT ETR*, in that the latter does not consider deferred taxes in the numerator. Thus, a lower *CURRENT ETR* arises from a lower numerator than that in the *GAAP ETR* and indicates that deferred tax liabilities exceed the deferred tax assets. As deferred tax liabilities present future tax payments, the three US firms presented in figure 6 are engaged in deferral tax strategies. The notes to income taxes report the composition of deferred taxes and thus show the reasons for the deviation between *GAAP ETR* and *CURRENT ETR*: in line with the expectation mentioned above, Apple's deferred tax liabilities exceed its deferred tax assets.[43]

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[40] C.f. Apple 10-K (2011), p. 63.
[41] Apple reports in its 10-K form of 2011 that no deferred tax liabilities have been provided on a cumulative total of $23,400 million, please refer to Apple 10-K (2011), p. 62.
[42] C.f. Amazon 10-K (2011), p. 66; Google 10-K (2011), p. 79.
[43] C.f. Apple 10-K (2011), p. 63.

Further, Apple reports in its notes that 97 % of the deferred tax liabilities arise from unremitted earnings of foreign subsidiaries and thus explain the major part of the deviation between the *GAAP ETR* and the *CURRENT ETR*.[44]

The recognition of deferred tax liabilities on undistributed foreign earnings shows that Apple does not classify all its undistributed foreign earnings as permanently reinvested outside the US. A similar procedure is found for Amazon.[45] In contrast, Google classifies all its undistributed foreign earnings as permanently reinvested outside the US.[46] Google's uniform classification explains the substantial deviation from its *GAAP ETR* to the US statutory tax rate: Google's ETR reconciliation shows that its *GAAP ETR* is reduced by 16.2 percentage points due to permanent differences on foreign tax rate differentials. Moreover, the conducted classification of undistributed foreign earnings explains the small difference between Google's *GAAP ETR* and *CURRENT ETR,* as no deferred tax liabilities are recognized for foreign tax rate differentials.[47]

The third finding above mentions a lower *CASH ETR* compared to the *CURRENT ETR* for those selected US firms. Without having more information, it is not possible to interpret this as an overstatement of current tax expenses.[48] However, additional information in the notes to cash taxes paid explains the deviation: Apple, Amazon and Google each refer to tax benefits arising from the excess of stock-based compensation as an explanation for their low cash taxes paid.[49] Comparing the *CASH ETRs* with the firms' *CASH ETR5s* indicates further that the three US firms were not able hold their *CASH ETR*s as low as in 2011 over several years.

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[44] C.f. Apple 10-K (2011), p. 63. Dividing deferred tax liabilities on unremitted earnings of foreign subsidiaries ($8,896 million) by total deferred tax liabilities ($9,168 million) results in 97 %.

[45] Deferred tax liabilities raising from foreign tax rate differentials also explain Amazon's higher *GAAP ETR* compared to the *CURRENT ETR*. Amazon further informs about the magnitude of its permanently reinvested earnings: while $3,600 million are remitted in foreign subsidiaries, $2,0 million are classified as permanently reinvested outside the US. Please refer to Amazon 10-K (2011), p. 23.

[46] C.f. Google 10-K (2011), p. 78.

[47] C.f. Google 10-K (2011), p. 78–79.

[48] E.g., lower cash taxes paid compared to current tax expenses could also be explained by tax refunds in the current period.

[49] C.f. Apple 10-K (2011), p. 63; Amazon 10-K (2011), p. 65; Google 10-K (2011), p. 41.

In contrast to the three selected US firms, not all prior findings can be confirmed for the German-based SAP. First, the *GAAP ETR* of SAP is 27.9 % and thus slightly higher than the applicable German statutory tax rate of 26.3 % in 2011.[50] The ETR reconciliation of SAP shows that the higher *GAAP ETR* arises from nondeductible tax expenses, withholding taxes and tax rate differentials.[51] This indicates that SAP is liable to tax payments in foreign countries with higher statutory tax rates than those applicable in Germany. Related to this finding, it is further reasonable to find a higher *FOREIGN ETR* than SAP's *GAAP ETR*. Consistent with the second finding of the US firms, SAP's *CURRENT ETR* is also below its *GAAP ETR*. While deferral tax strategies result in a substantial difference between both measures for Apple (8.4 percentage points) and Amazon (14.8 percentage points), the smaller difference between SAP's *GAAP ETR* and *CURRENT ETR* (3.7 percentage points) is more comparable to the difference found between Google's ETRs (2.8 percentage points). In contrast to Apple and Amazon, Google and SAP are both not required to recognize deferred tax liabilities on foreign tax rate differentials, and thus, this similarity seems to be reasonable.[52]Also in line with the third finding for US firms mentioned above, SAP's *CASH ETR* is smaller than its *CURRENT ETR*. However, unlike the three selected US firms of this case study, SAP mentions neither employee stock options nor other reasons for the deviation between the two ETRs.

Three aspects should be mentioned to conclude: first, until 2017, the US statutory tax rate was among the highest worldwide and thus explains the difference between the *GAAP ETRs* and *FOREIGN ETRs* of US firms. Second, the territorial tax system is applicable in most European countries, and thus, foreign tax rate differentials are treated as permanent differences that affect a firm's *GAAP ETR*. In contrast, the worldwide tax system was applicable in the US

[50] SAP explains that the applicable statutory tax rate in Germany of 26.3 % consists of the corporate income tax rate, solidarity surcharge and trade taxes. See further SAP Consolidated Statements (2011), p. 206.

[51] C.f. SAP Consolidated Statements (2011), p. 206.

[52] While Google has no deferred tax liabilities on tax rate differentials due to undistributed foreign earnings, as those are classified as permanently reinvested, SAP does not have related deferred tax liabilities due to the territorial tax system applicable in Germany.

until 2017, and the *GAAP ETRs* and *CURRENT ETRs* of US firms depend on the classification choices made on undistributed foreign earnings. Third, the deviation between the *CASH ETRs* and *CURERNT ETRs* of US firms can be explained by specific accounting legislation for employee stock options under US GAAP.

2.4.3 Potential Influence of the US Tax Reform

In December 2017, US President Donald Trump signed the "Tax Cuts and Jobs Act" and reformed the US tax system. Those amendments affect not only tax expenditures of US firms but also tax expenditures of European firms with a US tax presence. The following discussion demonstrates the impacts on ETRs and focuses in particular on two crucial amendments of the US tax reform: first, the decline of the statutory tax rate from 35 % to 21 %, and second, the switch from a worldwide tax system to a territorial tax system.

First, a lower statutory tax rate in the home country of a firm leads in general to lower tax expenditures. Thus, the *CURRENT ETRs* and *CASH ETRs* of US firms will decrease due to a lower statutory tax rate. The overall effect on a firm's *GAAP ETR,* in contrast, is ambiguous and depends on whether deferred tax expenses or deferred tax revenues are higher because deferred taxes have to be calculated at the tax rate applicable on the reversal date of temporary differences. Section 2.3.2 demonstrates that, on average, deferred tax expenses are higher than deferred tax revenues for US firms from 2011 to 2015. Assuming that deferred tax expenses still exceed deferred tax revenues in 2018, lower *GAAP ETRs* will result due to the decline in the statutory tax rate. Taken into account that European firms also have activities in the US, although to a lesser extent than US firms, (smaller) effects will also be found on their ETRs. While a lower US statutory tax rate will also decrease the *FOREIGN ETR* of European firms with US activities, the *FOREIGN ETR* of US firms will not be affected.

While these demonstrated impacts will first arise when the US tax reform becomes effective in 2018, already recognized deferred taxes have to be remeasured before. On the

enactment date of the US tax reform, which was in December 2017, already recognized deferred taxes (payable in the US) have to be remeasured with the lower statutory tax rate of 21 %.[53] As mentioned before, deferred tax liabilities exceed deferred tax assets for most US firms in prior years, and thus, future tax payments that were expected at a rate of 35 % are now expected at the rate of 21 %. Thus, the remeasurement of deferred tax liabilities leads to tax benefits that increase the net income of 2017 and results in a lower *GAAP ETR*.[54] For example, Apple reports an overlap on deferred tax liabilities over deferred tax assets in 2017.[55] The lower US statutory tax rate will decrease the book value of its already recognized deferred tax liabilities. Thus, Apple's deferred tax expenses and *GAAP ETR* will decrease, while its net income will increase due to the remeasurement.

However, the remeasurement of deferred taxes is not favorable for everyone, i.e., when deferred tax assets exceed the liabilities.[56] For example, Amazon and Google report an overlap of deferred tax assets in 2016.[57] These already recognized deferred tax assets become less valuable under the new applicable statutory tax rate and thus have to be written down. The remeasurement of these deferred tax assets first increases the *GAAP ETR* and second decreases the net income of those firms in 2017.[58]

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[53] C.f. Amir, Kirschenheiter, and Willard (1997), p. 601.

[54] For example, Pfizer Inc. recently reported a $ 10,070 million benefit arising from the re-measurement of deferred tax liabilities. See further The Wall street Journal (30/01/2018), available at https://www.wsj.com/articles/pfizer-plans-5-billion-boost-in-u-s-manufacturing-from-tax-law-changes-1517319342.

[55] C.f. Apple 10-K (2017), p. 55. Apple's fiscal year ends on September 30. Thus, the 10-K of the year prior to the US reform (2017) is already available for Apple at the time this paper is written.

[56] In particular, banks still report deferred tax assets due to loss carry forwards that originated during the financial crisis. Those losses become less valuable under the new applicable statutory tax rate, and thus, these deferred taxes have to be written down. For example, Citigroup Inc., Goldman Sachs Group Inc. and Deutsche Bank AG suffer from the re-measurement of deferred tax assets due to the US tax reform. See further *Business Insider* (29/12/2017), available at http://www.businessinsider.de/goldman-citigroup-booking-losses-on-trumps-new-tax-rules-gop-tax-plan-2017-12?r=US&IR=T; *Financial Times* (05/01/2018), available at https://www.ft.com/ content/306e51ce-f215-11e7-b220-857e26d1aca4.

[57] C.f. Amazon 10-K (2016), p. 63; Google 10-K (2016), p. 78. Amazon's and Google's fiscal years end on December 31, and thus, the 10-K of 2016 is the most recent information available at the time this paper is written.

[58] Please note that the *CURRENT ETR* and the *CASH ETR* will be unaffected in 2017, as current tax expenses and cash taxes payables will decrease first when the new tax law enters into force in 2018.

The impacts on SAP ETRs are ambiguous without additional information. To give suggestions of the effect on its *GAAP ETR*, it is necessary to know how much of the deferred tax assets and liabilities are attributable to US activities. However, assuming that SAP's international business model stays comparable to 2016, when SAP earned approximately 32 % of its overall revenue in the US, a decrease due to the lower US tax rate in its *CURRENT ETR, CASH ETR,* and *FOREIGN ETR* is expected after 2017.[59]

The second crucial amendment of the US tax reform is the switch from a worldwide tax system to a territorial one. This change circumvents additional tax payments when foreign earnings are repatriated to the US and thus will lower the *CURRENT ETR* and the *CASH ETR* for US firms.[60] However, the so-called "toll charge" will have an opposing one-time impact: taxes on a mandatory deemed repatriation of undistributed foreign earnings are required. The toll charge depends on whether undistributed foreign earnings are reinvested in cash and liquid assets (15.5 %) or in no liquid assets (8.0 %). The toll charge can be paid in instalments over eight years. As Google's undistributed foreign earnings of $60,700 million reported at the end of 2016 might have increased in 2017,[61] the toll charge will be at least between $4,900 million and $9,400 million.

While the *FOREIGN ETRs* of US firms are not directly affected by the implementation of a territorial tax system, the *GAAP ETR* is affected. Deferred tax liabilities are no longer required for foreign tax rate differentials, as foreign earnings are now tax exempted. Instead, permanent differences arise due to tax rate differentials after the US tax reform. Thus, the switch to the territorial tax system results in a lower (higher) *GAAP ETR* for US firms when foreign earnings are earned in countries with an applicable statutory tax rate on average lower (higher)

[59] C.f. SAP Consolidated Statements (2016), p. F-63.
[60] The ETRs of European firms can also be affected if their US subsidiaries receive foreign earnings.
[61] C.f. Google 10-K (2016), p. 77.

than 21 %. Moreover, the *GAAP ETR* of US firms is no longer affected by classification choices on undistributed foreign earnings.

SAP's ETRs will only be affected by the switch to a territorial tax system in the US if a US subsidiary itself has foreign subsidiaries. However, even assuming that SAP has such an ownership structure, the impact will be less material than that for US headquartered firms.

2.4.4 Suitability of ETRs to Define Tax Avoidance

The public debate concerning very low tax expenditures of US firms is mostly based on *CASH ETRs* and *FOREIGN ETRs.*[62] The following examples intend to show why accusing a firm of being tax aggressive based on one of these measures might be a hasty conclusion.

First, *FOREIGN ETRs* consider only foreign tax expenses and pre-tax earnings. Thus, *FOREIGN ETRs* do not consider tax expenses that are related to foreign activities but payable in the firm's home country (e.g., transfer pricing adjustments, withholding taxes or taxes on foreign dividends under a worldwide tax system). Even if US firms such as Apple, Amazon, and Google have (very) low *FOREIGN ETRs,* their overall tax expenditures with regard to those foreign activities might be (much) higher in particular when foreign earnings are repatriated and taxed at the higher US statutory tax rate. Thus, the *FOREIGN ETR* is only an incomplete measure to judge about a firm's tax aggressiveness (worldwide).[63] Nevertheless, these arguments become less material after the US tax reform. In particular due to the implementation of the territorial tax system in the US, foreign earnings will no longer be taxed when repatriated to the US.

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[62] For example a low *FOREIGN ETR* is mentioned by *BBC* (04/11/2012), available at http://www.bbc.com/news/business-20197710, while critics on its *CASH ETR* arises in a report from *Huffington Post* (17/04/12), available at https://www.huffingtonpost.com/2012/04/17/apple-corporate-income-tax-rate_n_1429955.html.

[63] Counterarguments might state that firms such as Google that intended to never repatriate their foreign earnings to the US, benefit permanently from lower foreign statutory tax rates. Furthermore, obviously due to the switch to the territorial tax system after 2017, Google can now circumvent the higher US statutory tax rate when repatriating foreign earnings. However, Google is liable to pay a toll charge of 8 % or 15.5 % on those foreign earnings.

My second argument is related to the *CASH ETR* as a measure used to classify a firm as tax aggressive. The case study has shown that US firms were in particular able to reduce their *CASH ETR* due to tax benefits of employee stock options. To the best of my knowledge, those stock options are not seen as tax aggressive strategies. Of course, the low cash taxes paid could be due to other reasons that are not mentioned in the notes to the consolidated statements. However, figure 6 shows that none of the four selected firms are able to hold a low *CASH ETR* over several years, as in all cases, the *CASH ETR5* is higher. Figure 6 demonstrates further that the *CASH ETR5* of Apple is very close to its *CURRENT ETR*. In addition, as explained above, the differences between Apple's *CURRENT ETR* and its higher *GAAP ETR* is mostly based on temporary differences arising from lower foreign statutory tax rates. This means that Apple does not avoid these tax payments; instead, Apple defers these to future periods.

Third, ETRs are affected not only by tax planning activities but also by the applicable tax and accounting legislation. The statutory tax rate in the home country, therefore, plays an important role: the higher *GAAP ETR* found for US firms in section 2.3.2 indicates lower tax expenses for European firms. However, due to the on average lower applicable statutory tax rate in Europe, the finding does not imply that European firms are more tax aggressive than are US firms.[64] Moreover, different classification choices regarding undistributed foreign earnings made by Apple, Amazon, and Google explain the differences between their ETRs and demonstrates that lower ETRs do not necessarily imply more tax aggressiveness. Due to the US tax reform in 2017 and the abolishment of the worldwide tax system, those classification choices become less material, and the US tax legislation becomes more comparable to the majority of tax legislations in Europe. However, these classification choices and the statutory tax rate are just examples to state that the overall circumstances should be considered before a firm is accused of being tax aggressive just because it has a low ETR.

[64] Please refer to the discussion in section 2.3.2.

This leads to my last and more general argument: at what level of ETR is a firm considered to be tax aggressive? This obviously depends on the definition of tax aggressiveness. Blouin (2014) tries to define tax aggressiveness by separating it from tax planning activities. However, she comes to the same conclusion as Hanlon and Heitzman (2010) that no objective definition of tax aggressiveness has been found yet.

Even if ETRs seem not to be suitable to define tax aggressiveness, ETRs allow statements on whether a firm has lower (higher) tax expenditures than other firms do. To complete my analyses on the tax expenditures of Apple, Amazon, Google, and SAP for the year 2011, I set their ETRs in relation to all other US and European firms considered before in section 2.3. Table 1 shows the decile ranks of those four firms with regard to the different ETRs and thus indicates whether their ETRs are lower (higher) than the ETRs of the other firms of the sample.

Table 1. Deciles of ETRs

	Decile of				
Firms	GAAP ETR	CURRENT ETR	CASH ETR	CASH ETR5	FOREIGN ETR
Apple	4th	3rd	3rd	2nd	1st
Amazon	6th	3rd	2nd	1st	2nd
Google	3rd	4th	3rd	3rd	1st
SAP	5th	5th	4th	6th	7th

Notes: This table presents the deciles of Apple's, Amazon's, Google's, and SAP's different ETRs for the year 2011. The reference group includes all US and European firms based on the sample of section 2.3. While the lowest possible score is the 1st decile, the highest possible score is the 10th decile. ETRs are defined in table A2 of the appendix.

The three US firms considered in my case study, considering their *FOREIGN ETR,* belong to the lowest 2nd and 1st deciles. This means that at least 80 % of the sample has a higher *FOREIGN ETR.* In contrast, only 20 % of the sample has a higher *FOREIGN ETR* than the Europe-based SAP. Apple, for example, is claimed to be tax aggressive because of its very low *FOREIGN ETR* and *CASH ETR.* With regard to the *FOREIGN ETR,* this might be reasonable, as the results show that Apple's *FOREIGN ETR* belongs to the lowest within the considered

sample. However, at least 20 % of the considered sample has a lower *CASH ETR* than Apple does in 2011. Furthermore, Amazon, for example, belongs to the 2nd decile with regard to its *FOREIGN ETR,* while it belongs to the 6th decile with its *GAAP ETR*. A similar pattern, although not as strong, can be found for Google. All in all, these findings are in line with Blouin (2014), as she claims that future research should not rely on one single measure when analyzing tax aggressiveness. In contrast to the selected US firms, SAP's *FOREIGN ETR* is higher than 60 % of the considered sample, while its other ETRs are neither conspicuously high nor conspicuously low.

Summarizing the case study, three aspects should be mentioned: first, the analyses do not intend to classify a firm as being tax aggressive or not. This is because, second, the usefulness of ETRs is doubtful in defining a firm as tax aggressive. However, when understanding the informative value and the applicable accounting and tax legislations, ETRs are suitable for comparing tax expenditures.

2.5 Conclusion

This paper describes the information content and investigates the differences of five different ETR measures. By analyzing the differences of ETRs between US and European firms, my results suggest that the higher *GAAP ETRs* of US firms are in particular attributable to deferred tax liabilities that are higher than those of European firms. Moreover, the comparisons demonstrate that due to the relatively high statutory tax rate applicable in the US until 2017, US firms benefit more from foreign tax differentials than do European firms.

The results of the case study demonstrate the implications that arise due to classification choices on undistributed foreign earnings under US GAAP. While deferred tax liabilities increase the *GAAP ETR* when undistributed foreign earnings are not permanently reinvested outside the US, a lower *GAAP ETR* results if undistributed foreign earnings are classified as being permanently reinvested. However, those classification choices will become less material

after the US tax reform in 2017. The notes to the income taxes of the three US firms selected for the case study suggest further that US firms face lower *CASH ETRs* due to specific accounting legislation on employee stock options.

Moreover, the case study cautions against conclusions that rely on single ETR values, as a low ETR does not necessarily arise due to aggressive tax strategies. While my discussion suggests that ETRs are not perfect measures to identify tax aggressiveness, they are, however, suitable for comparisons of tax expenditures. Therefore, researchers should always keep in mind the applicable tax and accounting legislation of each firm when analyzing ETRs.

I acknowledge that my comparisons and analyses of differences in ETRs are primarily anecdotal and that more detailed analyses, which follow in the next chapter of this thesis, are necessary to strengthen my findings. However, my analyses support the understanding of the information content of different ETR measures and tax differentials between US and European firms.

Appendix

Table A1. Overview of Effective Tax Rates

ETR Measure	Reflects Deferral Tax Strategies?	Reflects Permanent Tax Strategies?	Reflects Conforming Tax Avoidance?	Reflects Non-conforming Tax Avoidance?	Affected by changes in the tax contingency reserve or valuation allowance?	Able to interpret years with negative tax expenditures or pre-tax income?
GAAP ETR	NO	YES	NO	YES	YES	NO
CURRENT ETR	YES	YES	NO	YES	YES	NO
CASH ETR	YES	YES	NO	YES	NO	NO
CASH ETR5	YES	YES	NO	YES	NO	YES*
FOREIGN ETR	NO	YES	NO	YES	YES	NO

Notes: This table gives an overview of the information content of different ETRs. It is in principle based on an overview given by Hanlon and Heitzman, 2010 (p. 140) and completed with additional information. ETRs are defined in table A2 of the appendix. (*)Years with negative tax expenditures (pre-tax income) are considered when calculating the *CASH ETR5*. However, *CASH ETR5* is only interpretable when the summated tax expenditures (pre-tax income) over five years are positive.

Table A2. Variable Definitions

US	Dummy, which is one for US MNCs and zero for European MNCs
EU	Dummy, which is one for European MNCs and zero for US MNCs
GAAP ETR	txt / (pi – xi), i.e., income taxes divided by pre-tax income, adjusted for extraordinary items (set to zero if missing); exclude outliers
CURRENT ETR	(txt - txdi) / pi, i.e., current taxes divided by pre-tax income; exclude outliers
CASH ETR	txpd / pi, i.e., taxes paid divided by pre-tax income; exclude outliers
CASH ETR5	(txpd 5yr) / (pi 5yr), i.e., cash taxes paid (sum over five years) divided by pre-tax income (sum over five years); exclude outliers
FOREIGN ETR	txfo / pifo for US MNCs, i.e., foreign income taxes divided by foreign pre-tax income; exclude outliers; (txt – txdom) / (pi – pidom) for European MNCs, i.e., domestic taxes subtracted from total taxes divided by pre-tax income excluding domestic pre-tax income; exclude outliers. E.g., the France-based Danone SA has 14 subsidiaries in France. Adding up the tax expenses of these subsidiaries (derived from unconsolidated financial information offered by the *Amadeus* Database) creates the approximated domestic (French) tax expenses of Danone SA. Subtracting this domestic figure from the overall tax expenses (derived from consolidated statements offered by *Compustat Global*) of Danone SA results in foreign tax expenses. Same method is applied in order to determine the foreign pre-tax income and thus, to calculate the *FOREIGN ETR* of Danone SA. Note that the parent firm is excluded from the calculation of the domestic data, as double counting of subsidiaries profits would potentially overstate the pre-tax income compared to tax expenses.
STR	Statutory corporate tax rate applicable in the home country
MNC	Dummy, which is one for firms having at least one foreign subsidiary or foreign pre-tax income is greater than zero
Domestic	Dummy, which is one for firms that do not have a foreign subsidiary or foreign pre-tax income greater than zero
Index	Dummy, which is one for firms listed on the S&P500 or StoxxEurope600 stock market indices

Notes: Data are taken from *Compustat* and *Compustat Global*. Foreign tax expenses and pre-tax income for European MNCs were calculated by combining the *Compustat* and *Amadeus* databases. The statutory tax rates were collected from the worldwide corporate tax summaries of PwC, KPMG, and EY.

Table A3. Sample Selection

	US Firms		European Firms	
Description	Firms	Firm-Years	Firms	Firm-Years
Headquarters in EU / US	10,123	39,835	8,400	34,837
Non-Missing Financial Data	3,456	10,361	2,997	9,413
At least 100 observations per country	3,456	10,361	2,826	8,975
- thereof Non-Missing FOREIGN ETR	1,417	4,249	466	1,320

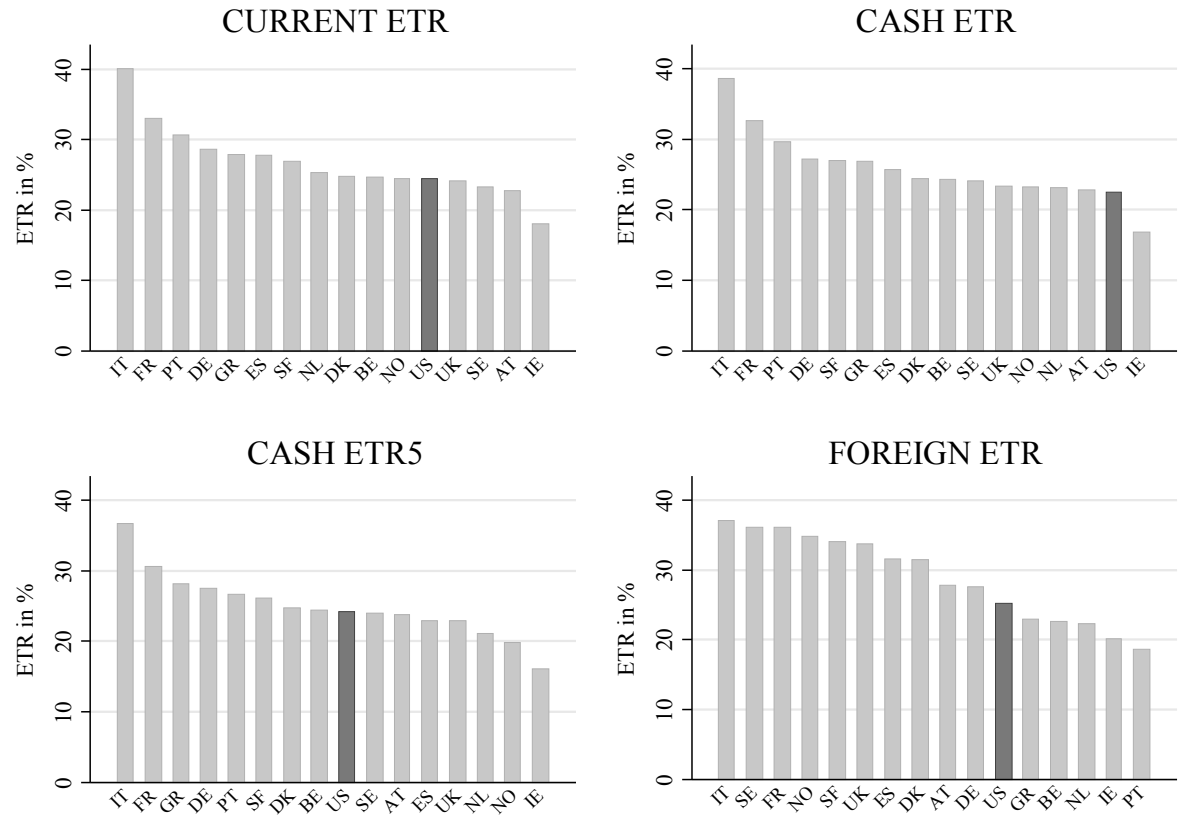
Notes: The sample is based on firms that were incorporated in the US or Europe during the time from 2011 through 2015.

Table A4. Descriptive Statistics

	US Firms			European Firms		
Variable	N	Mean	Std. Dev.	N	Mean	Std. Dev.
GAAP ETR	10,361	28.60	14.44	8,975	27.46	13.75
CURRENT ETR	10,361	24.43	16.89	8,975	27.02	15.25
CASH ETR	10,361	22.44	17.29	8,975	26.26	17.34
CASH ETR5	6,107	24.21	12.31	5,144	25.67	10.66
FOREIGN ETR	4,249	25.19	15.07	1,320	32.74	19.18
Total Tax Expenses	10,361	194.08	892.50	8,975	122.78	799.23
Current Tax Expenses	10,361	169.87	806.83	8,975	125.45	795.34
Deferred Tax Expenses	10,361	24.22	219.27	8,975	-2.68	129.22
STR	10,361	35.00	0.00	8,975	27.25	5.10
MNC	10,361	0.67	0.47	8,975	0.49	0.50
Index	10,361	0.21	0.41	8,975	0.24	0.43

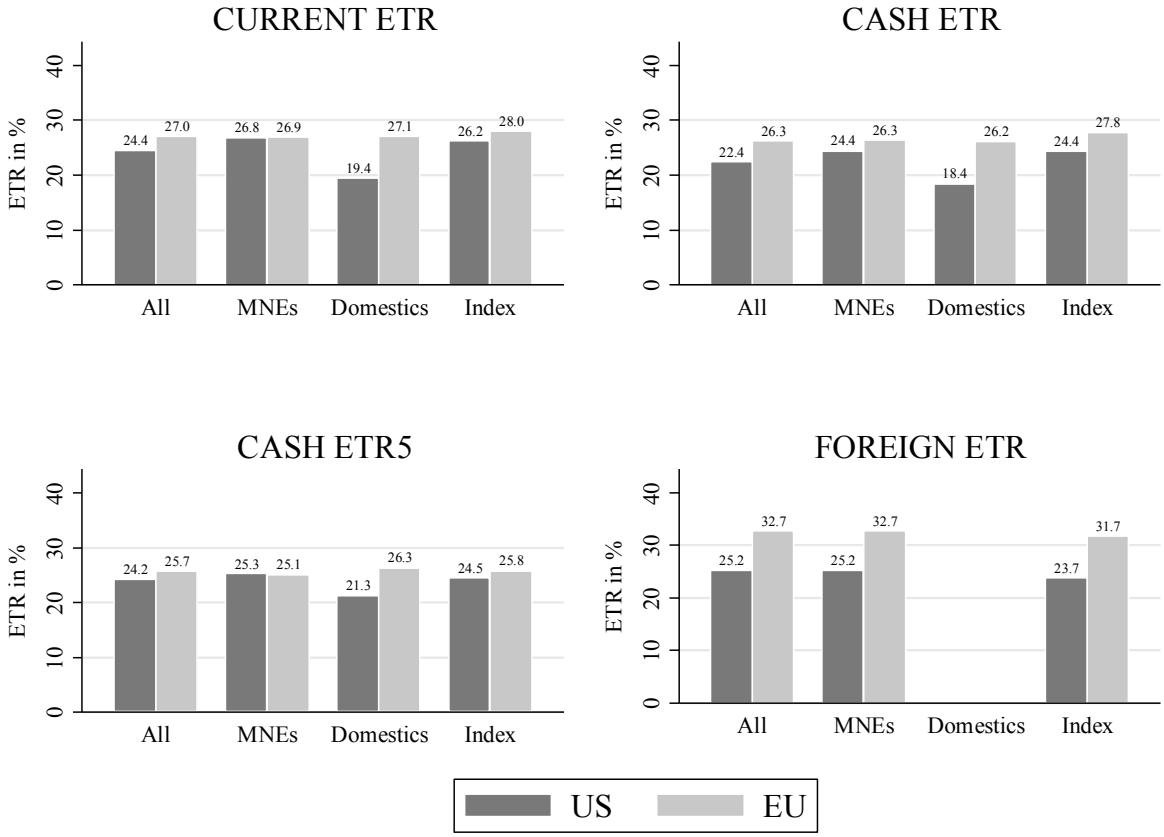
Notes: This table shows the descriptive statistics of the sample during the time from 2011 through 2015. Variables are defined in table A2.

Figure A1. ETR Comparison over different Countries



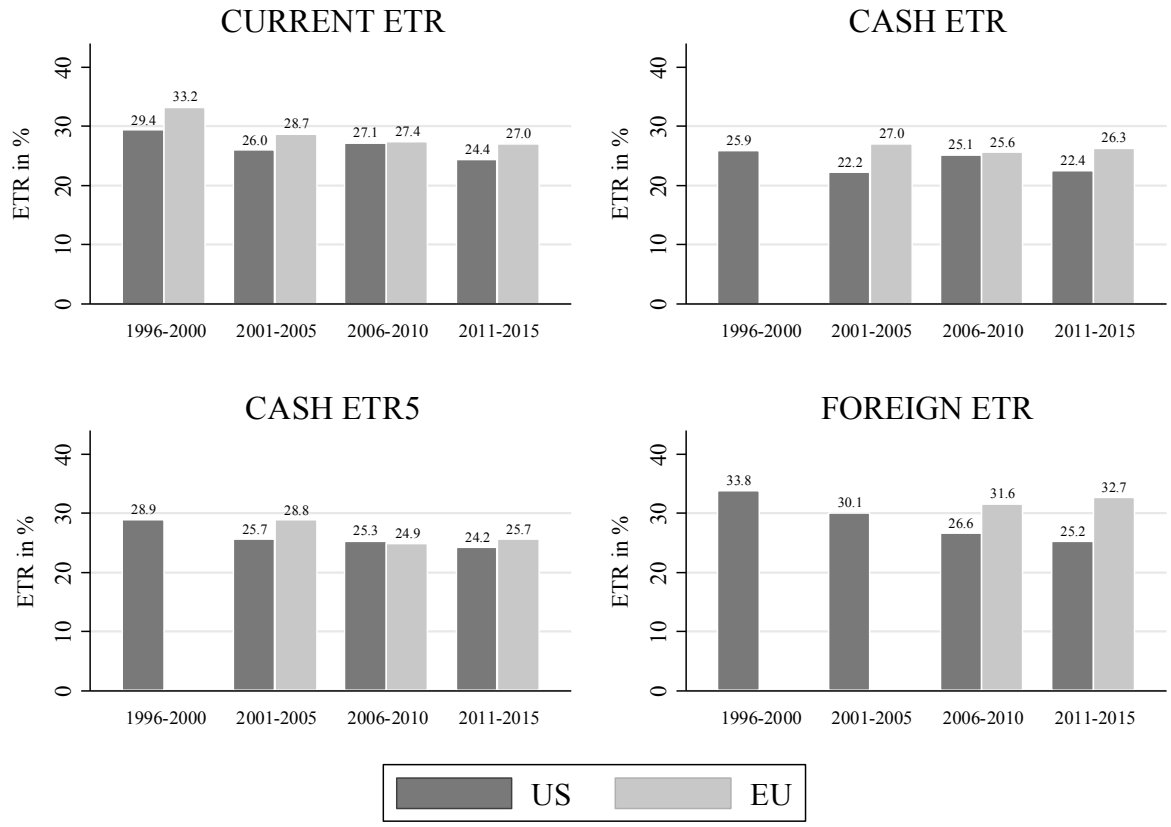
Notes: The figure compares the average ETRs of different countries. The sample is based on the years from 2011 through 2015. ETRs are defined in table A2 of the appendix.

Figure A2. ETR Comparison over Subsamples



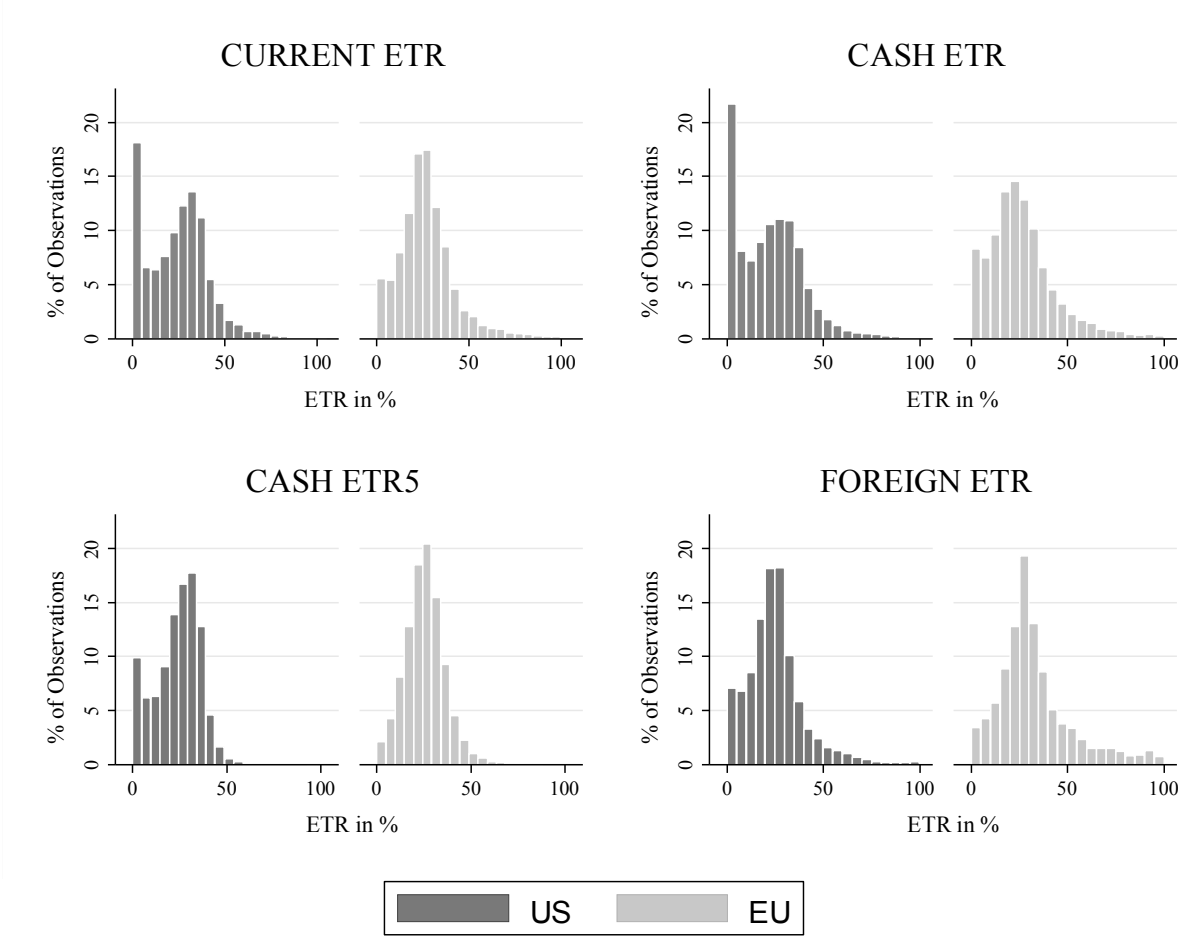
Notes: The figure compares the average ETRs between different subsamples of US and European firms. The sample is based on the years from 2011 through 2015. The first two bars (All) of each comparison include all observations. A firm is considered as multinational (MNCs) if it has at least one foreign subsidiary or its foreign pre-tax income is greater than zero, all other firms are considered as being domestic (Domestics). The last two bars (Index) of each comparison consider firms that are listed on the S&P500 or StoxxEurope600 stock market indices. ETRs are defined in table A2 of the appendix.

Figure A3. ETR Comparison over Time



Notes: The figure compares the development of the average ETRs between US and European firms over time. The sample is based on the years from 1996 through 2015. Please note that due to missing data, I am not able to compute the *CASH ETR* for European firms for the years from 1995 through 2000. Thus, the *CASH ETR5* can also not be calculated for the years from 2000 through 2004 which implies that the bar related to the *CASH ETR5* of the years from 2000 through 2005 includes only the year 2005 for European firms. Further, the *FOREIGN ETR* cannot be calculated for European firms for the years from 1995 through 2005. ETRs are defined in table A2 of the appendix.

Figure A4. Distribution of ETRs



Notes: The figure compares the distribution of the average ETRs between US and European firms. The sample is based on the years from 2011 through 2015. The ETRs are defined in table A2 of the appendix.

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Chapter 3

Do US Firms Pay Less Tax than their European Peers?

On Firm Characteristics, Profit Shifting Opportunities, and Tax Legislation as Determinants of Tax Differentials

Do US Firms Pay Less Tax than their European Peers? On Firm Characteristics, Profit Shifting Opportunities, and Tax Legislation as Determinants of Tax Differentials

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Abstract:

Using pairs of similar US and European firms listed on the S&P500 or StoxxEurope600, we examine effective tax differentials between US multinational corporations (MNCs) and their European peers. We show that statutory tax rates and profit shifting opportunities are important determinants of effective tax rates. Our findings suggest substantially lower total tax expenses of US MNCs after the 2017 US tax reform. Based on past reforms of Controlled Foreign Company (CFC) rules and of the principle of worldwide taxation, we confirm that international tax legislation affects effective tax expenses. We also provide evidence for heterogeneity in firm responses: MNCs with profit shifting opportunities benefit most from more-lenient CFC rules.

Keywords: Effective Tax Rate, Tax Avoidance, Tax Reform, CFC Rule, International Taxation, Pair Matching, Difference-in-Differences Analysis

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Chapter 3

Tables

Figures

3.1 Introduction

Until the fundamental US tax reform was enacted in December 2017, the US statutory tax rate on corporate profits was one of the highest in a worldwide comparison.[65] Many agree that the high home country tax was particularly problematic in an international context, as foreign profits are taxed upon repatriation under the US system of worldwide taxation, while most European countries exempt foreign income from any home taxation. The "Tax Cuts and Jobs Act" in December 2017 has responded to these arguments. The US corporate tax rate was cut to 21 % and the worldwide tax system was replaced by a territorial system.

Yet not everyone shares the concern of a potential competitive disadvantage of US MNCs. In an interview on the Irish tax ruling of *Apple Inc.* Margrethe Vestager, the European Union's commissioner for competition, said that "*it is irritating when American companies pay less in taxes than European ones*".[66] Apple Inc., with an effective foreign tax rate of below 4 % in recent years, is one of quite a few examples of well-known US MNCs reporting low effective tax rates (ETRs) on their foreign incomes.[67] The statement by Mrs. Vestager highlights a common concern that US MNCs had already a competitive advantage relative to their European competitors through substantially lower tax expenses before the major US tax reform was enacted.

The objective of this study is to add to this debate by comparing and analyzing the tax expenses of US MNCs and their European peers. Our analysis focuses on large MNCs listed either on the S&P500 or StoxxEurope600 stock market indices. One main contribution of our study is that we examine effective tax differentials between US MNCs and their European

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[65] For example, Swenson and Lee (2008) emphasize that *"US companies are overtaxed relative to their international competitors"*.

[66] *Bloomberg* (19/09/2016), available at http://www.bloomberg.com/news/articles/2016-09-19/eu-s-vestager-signals-apple-just-the-start-of-u-s-tax-probes.

[67] For more examples, see *The Financial Times* (30/09/2013), available at http://www.ft.com/cms/s/0/c6ff0ebc-29c4-11e3-bbb8-00144feab7 de.html.

competitors. While previous evidence suggests that the headquarters location of an MNC has a major effect on its worldwide tax expenses (Markle and Shackelford, 2012a), existing studies do not provide clear evidence on whether US or European MNCs pay less taxes (Avi-Yonah and Lahav, 2012; PricewaterhouseCoopers, 2011). Moreover, it is largely unexplained whether tax differentials between European and US MNCs must be attributed to differences in home country tax legislation or if they can be explained by firm characteristics. Therefore, the second aim of our analysis is to understand the determinants of tax differentials and whether these reflect differences in firm characteristics distinctive to either US or European MNCs (e.g., technology) or are rather driven by tax legislation. We investigate the impact of (i) home country statutory tax rates, (ii) tax planning opportunities, (iii) Controlled Foreign Company (CFC) legislation, and (iv) home country taxation of foreign income. Issues that were also recently addressed by the US "Tax Cuts and Jobs Acts".

We propose an empirical approach that recognizes fundamental problems of identification in this context. First, we identify pairs of similar US and European MNCs, given observable firm characteristics. Besides firm characteristics, the matching of firm-pairs imposes further restrictions, such as the exact matching on the industry a firm is operating in. For example, the European *Danone S.A.* is found to be the best match for the US headquartered *Kellogg Corp.*, and the Europe-based *SAP SE is* found to be the best match for the US-based *Oracle Corp.* Running regressions on the matched sample conditional on pair fixed effects allows us to analyze the determinants of effective tax rate differentials that arise between very similar US and European MNCs. Of particular interest, then, is determining whether differentials are the result of policy reforms or whether responses to changes in policy depend on individual tax planning opportunities. To the best of our knowledge, a thorough comparative study of US and European MNCs in terms of tax expenses has not been provided so far.

Based on our matched sample of MNCs listed either in the S&P500 or the StoxxEurope600, we start our analysis by comparing the effective tax rates (ETRs) of US and European MNCs over recent years. The findings suggest that US MNCs have paid significantly less foreign taxes (measured as a foreign effective tax rate, *FOREIGN ETR*) but have reported significantly higher total tax expenses (measured by *GAAP ETR*) compared to their European counterparts. To be precise, the *FOREIGN ETRs* of US MNCs are found to be 9.6 percentage points lower compared to European MNCs, while the *GAAP ETR* of US MNCs was approximately 2.1 percentage points higher. Moreover, additional analyses demonstrate that US MNCs have reported significantly lower ETR measures that exclude deferred tax expenses (measured by *CURRENT ETR* and *CASH* ETR).

We then test whether differences in tax institutions and tax planning opportunities can explain the tax rate differentials. First, our analysis suggests that the high *GAAP ETR* of US MNCs can be attributed to the high corporate tax rate in the US prior to the fundamental US tax cut in 2017. Second, while US firms usually paid less foreign taxes, we show that a significant part of the difference can be attributed to enhanced profit shifting opportunities of US MNCs. A central result of our analysis is that US MNCs, compared to European ones, were able to reduce tax expenses through profit shifting, which compensates for a higher tax rate at home.

Additional analysis is concerned with tax policy as a determinant of tax differentials between US MNCs and their European peers. Based on our matched sample of comparable US and European MNCs, we estimate our regression model with pair fixed effects (given the matched pairs) and a difference-in-differences approach to pinpoint responses to changes in policy.

With the goal of restricting tax planning activities and to prevent erosion of their corporate tax bases, most countries have implemented a vast number of tax laws and

regulations. The US CFC rules are often mentioned to be ineffective and thus one of the main causes of the low foreign tax expenses of US MNCs.[68] We therefore analyze the effectiveness of US and European CFC rules as a potential explanation for the tax differentials between US and European MNCs. We exploit two tax law amendments that changed the application of CFC rules: the introduction of the Check the Box (CTB) option, which allows US MNCs to avoid US CFC rules, is expected to increase the tax differential between US and European firms. Similarly, in 2006, European CFC rules were adjusted after the European Court of Justice's (ECJ) "Cadbury Schweppes" judgment,[69] with the result that the rules today apply only to "wholly artificial arrangements". We find that European MNCs have reduced their tax expenses significantly since the ECJ judgment. To be precise, our results suggest that European firms reduced their *GAAP ETRs* by approximately 2.6 percentage points after the Cadbury Schweppes judgment. The introduction of CTB in the US led to 4.6 percentage points lower ETRs of US MNCs. This means that both US and European CFC rules became more lenient and less effective over time.

Another issue raised by the fundamental US tax reform is the replacement of the worldwide tax system by a territorial tax system. We analyze whether the international tax system has implications for tax differentials between competitors. While the change in the US international tax system in 2018 cannot yet be evaluated, we exploit the 2009 UK tax reform, through which the UK switched from a worldwide system of taxation to a territorial one. Based on a matched sample, we find that the reform has reduced the *GAAP ETRs* of UK MNCs by more than 2 percentage points. However, we do not find evidence that firms with additional profit shifting opportunities have benefited more from the switch to a territorial system. Moreover, the *FOREIGN ETR* of UK MNCs was unaffected by the reform.

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[68] *Tax Justice Blog* (20/07/2015), available at http://www.taxjusticeblog.org/archive/2015/07/like_a_campy_ horror_ movie_the.php#.V-gdyclrPo0.

[69] Judgment from September 12, 2006, C-196/04.

Our study contributes to the literature and to the recent public debate on the tax expenses of MNCs in several ways. In contrast to previous studies, our paper compares ETRs of US and European MNCs at the micro level, uses different measures of ETRs, allows for pairwise comparisons, conditions on firm-specific characteristics, and provides causal evidence on the consequences of tax reforms. Let us highlight that, to the best of our knowledge, none of the previous studies has conditioned on between-pair unobserved heterogeneity combined with a difference-in-differences approach to provide causal evidence on the consequences of policy reform in the empirical analysis, has calculated *FOREIGN ETRs* for non-US MNCs (and other alternative measures of tax expenditures), and has provided heterogeneous estimates on the determinants of ETRs to better understand why there is so much variation in firms' effective tax expenses. However, our paper is related to previous studies. First, earlier contributions have analyzed the determinants of tax avoidance and effective tax expenses. For example, a broad body of literature examines the ETRs of US MNCs (Dyreng, Hanlon, Maydew, and Thornock, 2017; Yin, 2003). Only a few studies investigate the differences in tax expenses between the US and other countries of the world (Markle and Shackelford, 2012a; Swenson and Lee, 2008). To the best of our knowledge, only two studies compare (aggregate) tax expenses between the US and Europe (Avi-Yonah and Lahav, 2012; PricewaterhouseCoopers, 2011).

Second, our analysis is closely related to studies investigating the impact of home country tax systems and tax legislation, such as CFC rules and the system of international taxation. Dunbar and Duxbury (2015) find evidence that US MNCs reported 9 percentage points lower *FOREIGN ETRs* directly after the CTB introduction. Ruf and Weichenrieder (2013, 2012) investigate the consequences of the German CFC rule on the allocation of financial assets across affiliates held by German MNCs. Their findings suggest that the German CFC rule prevented German MNCs from holding financial assets in tax haven

countries until 2006, while German firms started to use low-tax countries within Europe much more heavily after the ECJ Cadbury Schweppes judgment. Related to this, previous research has found that the international tax system of the home country has implications for the tax planning activities of MNCs (Markle, 2016; Atwood, Drake, Myers, and Myers, 2012). Egger, Merlo, Ruf, and Wamser (2015) exploit the UK tax reform in 2009 and find that the abolishment of the worldwide tax system has affected repatriation behavior (see also Hasegawa and Kiyota, 2017, for a study on the Japanese switch to a territorial system).

The remainder of the paper is organized as follows. In the next section, we describe the institutional background and develop testable hypotheses. The data and research design are described in section 3.3. Empirical results regarding the differences in tax expenses between US and European MNCs are shown in section 3.4. The impact of tax planning opportunities and the home countries' tax rules are presented and discussed in section 3.5. Section 3.6 concludes.

3.2 Institutional Background and Research Hypotheses

The question of whether US MNCs are paying their fair share of taxes has become a central public concern. The argument is often used that European firms are unable to avoid taxes to the same extent and are therefore disadvantaged relative to their US competitors. Particularly well-known US firms, such as *Google Inc.*, *Amazon.com Inc.*, and *Starbucks Corp.*, are mentioned in public debate and are accused of avoiding taxes to a significant degree.[70] Having said that, many tax experts argue in turn that prior to the US tax reform, US MNCs were subject to the high US statutory tax rate on corporate profits and a worldwide tax system.

While many empirical studies analyze the tax expenses (measured as ETRs) of US firms, only a few empirical studies compare the tax expenses between different countries. These

[70] *BBC News Magazine* (21/05/2013), available at http://www.bbc.com/news/magazine-20560359.

studies come to opposing conclusions: Markle and Shackelford (2012a) compare the ETRs of US MNCs to those of Australian, French, German and UK firms and find a 1 percentage point *lower* average ETR of US firms compared to those of the other four countries. The study of Swenson and Lee (2008) suggests *higher* US ETRs if US MNCs are compared to MNCs headquartered in OECD[71] member states. We know of only two studies that compare US MNCs and European MNCs. PricewaterhouseCoopers (2011) analyzes the *Forbes Global 2000* list and finds a 5.8 percentage points *higher* ETR for US MNCs for the period 2006 to 2009, whereas Avi-Yonah and Lahav (2012) find a 4.0 percentage points *lower* ETR for the largest US firms during the period 2001 to 2010. Our paper is related to these studies because we analyze tax expense differentials between comparable US and European MNCs. Taking into account the aforementioned debate and, in particular, the concern of the high US corporate tax rate prior to the US tax reform, we test the following hypothesis:

H1a: US MNCs report higher GAAP ETRs compared to European MNCs.

The public debate about taxation of MNCs often refers to international tax avoidance. Accordingly, the public discussion is to a large extent based on the *FOREIGN ETR* of those firms.[72] Particularly, very low *FOREIGN ETRs* of some prominent US MNCs are mentioned. Regarding the tax expenses associated with foreign operations, we therefore test the following hypothesis:

H1b: US MNCs report lower FOREIGN ETRs compared to European MNCs.

Earlier studies suggest that differences in ETRs are naturally related to differences in industry membership and firm characteristics (Richardson and Lanis, 2007; Plesko, 2003; Rego, 2003; Gupta and Newberry, 1997; Stickney and McGee, 1982). By using matching techniques, our analysis addresses potentially confounding effects of firm characteristics. In

[71] OECD is the abbreviation for Organization for Economic Cooperation and Development.
[72] E.g., *BBC* (04/11/2012), available at http://www.bbc.com/news/business-20197710.

particular, we compare pairs of US and European MNCs[73] that belong to the same industry and have very similar firm characteristics.

While our analysis is based on novel data and techniques, which we believe are particularly suitable for making such a comparison, we primarily contribute to the literature by focusing on possible explanations for the observed tax expense differentials between US and European MNCs. In the following, we will formulate more-specific hypotheses along the determinants of effective taxes to learn about the origins of the tax differential between US and European firms. As possible determinants thereof, we suggest differences in *(i) home country statutory tax rates, (ii) tax planning opportunities*, *(iii) CFC legislation*, and *(iv) home country taxation of foreign income.*

(i) Home Country Statutory Tax Rates

A potential reason for differences in tax expenses between US and European MNCs might simply be the direct effect of the level of the corporate income tax rate at home. While the US statutory tax rate was among the highest in the world prior to the "Tax Cuts and Jobs Act",[74] corporate income tax rates in Europe vary across countries and were, on average, significantly lower than in the US. Home country statutory tax rates affect the ETR, as the profits of the ultimate parent company and operations in the home country are taxed at this rate. Moreover, given the worldwide tax system, the high US statutory tax would be the minimum tax rate when profits were repatriated. Many US firms urged therefore policymakers to cut the statutory tax rate in order to avoid a competitive disadvantage.[75] All this suggests that naive comparisons between US and European firms might be misleading with regard to tax avoidance,

[73] Our comparison focuses on the MNCs listed on the two leading stock market indices, S&P500 and StoxxEurope600.

[74] *Tax Foundation* (07/09/2017), available at https://taxfoundation.org/corporate-income-tax-rates-around-the-world-2017/. Note that our sample period ends in 2015. Nowadays, the US do no longer have the highest corporate tax rate worldwide due to the US tax rate cut in 2017.

[75] *The Financial Times* (02/05/2011), available at http://www.nytimes.com/2011/05/03/business/economy/03rates.html?_r=1.

and the empirical analysis should be conditional on the home statutory tax rate. This leads to our second hypothesis:

H2: US MNCs report lower effective tax rates compared to European MNCs, conditional on the high statutory corporate tax rate in their home country.

(ii) Tax Planning Opportunities

International tax planning seems to be an important determinant of MNCs' tax expenses. Previous literature provides convincing evidence that MNCs shift taxable income to low-tax subsidiaries in order to minimize their overall tax expenses (Heckemeyer and Overesch, 2017; Huizinga and Laeven, 2008; Hines and Rice, 1994). The main channels through which income is shifted are transfer prices for intrafirm transactions and the strategic use of internal capital markets and internal debt financing. For example, MNCs may determine transfer prices such that high expenses accrue at subsidiaries located in high-tax countries, while high earnings should accrue at low-tax subsidiaries (Davies, Martin, Parenti, and Toubal, 2018; Cristea and Nguyen, 2016). A similar strategy allows MNCs to utilize their internal capital markets: providing loans from subsidiaries at low-tax locations to subsidiaries at high-tax locations gives rise to a tax shield at the high-tax location (Buettner and Wamser, 2013; Huizinga, Laeven, and Nicodème, 2008; Desai, Foley, and Hines, 2006).

The opportunities to reduce tax expenses through profit shifting depend on the specific business models of firms. For example, large amounts of intangible assets or R&D-intensive businesses facilitate the profit shifting activities of MNCs (Grubert, 2003; Harris, 1993). Hence, differences in tax expenses between US and European MNCs may relate to differences in the fundamental characteristics of firms and their businesses. But even if we compare very similar firms and align firm characteristics, US MNCs might still avoid more (or less) taxes compared to their European peers if the shifting opportunities differ between US and European firms.

These differences may arise from specificities in business models, products, or production processes. Hypothesis H3 follows:

H3: Differences in tax expenses of very similar US and European MNCs are related to differences in profit shifting opportunities associated with fundamental firm characteristics.

(iii) Controlled Foreign Company Rules

The extent to which MNCs engage in tax saving activities might be determined by the taxation of foreign income in the home country of the firm. In particular, so-called Controlled Foreign Company (CFC) rules are implemented by the home countries of MNCs to restrict profit shifting activities. Thus, CFC rules should affect ETRs. While such rules are established in the US and in many European countries, they often differ in application and scope. What they have in common, however, is that they aim at preventing MNCs from shifting passive income (such as royalty or interest income) to low-tax countries. If a foreign subsidiary meets the criteria of a controlled foreign company, foreign profits to which a CFC rule is applied to will be taxed at the (higher) tax rate of the country of the parent firm. In addition, the usual privilege of exemption upon deferral is not granted to income taxed under a CFC rule. We therefore expect that changes in the scope and application of CFC rules should be reflected in tax differentials between European and US firms.

Tax experts have considered the implementation of the so-called "Check the Box" (CTB) regulation in 1997 as a substantial change in the practical application of US CFC law. The CTB option was introduced in the US with the aim to simplify entity classification rules. However, part of the new legislation allows US MNCs to avoid Subpart F by checking the box to classify an affiliate as a "disregarded entity".

Altshuler and Grubert (2006) suggest that using the CTB rule was associated with foreign tax savings of approximately $7.0 billion in 2002. Costa and McGrath (2010) also argue

that CTB is an important tool to avoid Subpart F, as 69 % of new foreign entities checked the box in order to be a disregarded entity for US tax purposes. Grubert (2012) finds that the *FOREIGN ETR* of US MNCs has declined by nearly 2 percentage points since the introduction of CTB. Dunbar and Duxbury (2015) provide evidence that US MNCs were able to reduce their *FOREIGN ETRs* by approximately 9 percentage points compared to non-US MNCs immediately after the introduction of CTB in 1997. Furthermore, a decrease in the *CASH ETR* of US MNCs due to CTB is suggested by Dyreng, Hanlon, Maydew, and Thornock (2017).

European CFC rules were also subject to a drastic change in the way CFC legislation is applied by European countries. In 2006, the European Court of Justice (ECJ) decided that CFC rules infringe upon the European principle of freedom of establishment, and it restricted their applicability. The so-called "Cadbury Schweppes" judgment limited the application of CFC rules within Europe to wholly artificial arrangements that do not reflect any economic activity (e.g., pure letter boxes). European countries had to adjust their CFC rules. It seems that Cadbury Schweppes rendered CFC application within Europe more or less ineffective, as wholly artificial arrangements can be easily avoided by firms (Bräutigam, Spengel, and Streif, 2017). While German MNCs appear to have held only small financial investments in European low-tax countries before the ECJ judgment, they substantially increased passive investments in the aftermath of the ECJ judgment (Ruf and Weichenrieder, 2013, 2012). By and large, it seems that the literature agrees on the interpretation that the ECJ judgment has facilitated tax planning within Europe for European MNCs since 2006 to a significant degree.

We examine how changes in the application of CFC rules in the US and Europe affected the tax differentials between European and US MNCs. Based on the explanations above, we state our fourth hypothesis:

H4a: Changes in the application of CFC rules in the home countries affect the effective tax expenses of MNCs.

CFC rules are anti-tax avoidance measures applied by home countries to prevent home resident MNCs from allocating mobile income to low-tax countries. Thus, we expect that changes in the CFC rules affect particularly MNCs with more profit shifting opportunities. This suggests the following:

H4b: Changes in the application of CFC rules in the home countries should particularly affect MNCs with large profit shifting opportunities.

(iv) Home Country Taxation of Foreign Income

An additional feature of a home country tax system is the general taxation of foreign income. Nearly all European countries have implemented a territorial system.[76] In the US, a worldwide tax system had been applicable until 2017 when the foreign tax credit was replaced by a territorial tax system.

Under a worldwide tax system, dividends from foreign subsidiaries are taxed upon repatriation. The overall tax expenditures is equal to the (possibly) high tax level of the home country, but only when profits are repatriated to the parent. In contrast, under a territorial tax system, dividends repatriated to the parent are partially or wholly exempt from tax in the home country.

Due to the additional tax on dividends repatriated to US parent firms, many argue that this was a competitive disadvantage for US MNCs relative to MNCs operating under a territorial system (e.g., Hines, 2011). In line with these arguments, earlier research has found enhanced tax planning activities for MNCs headquartered in countries with a territorial tax system compared to MNCs from countries with a worldwide tax system (Dyreng and Markle, 2016; Markle, 2016; Atwood, Drake, Myers, and Myers, 2012). In contrast, anecdotes of US MNCs suggest that different strategies, such as using a series of short-term loans, have

[76] Nowadays, Ireland is the only European country with a worldwide tax system. See further worldwide corporate tax summaries of PwC, KPMG, and EY.

been used to shift money back to the US without paying repatriation tax.[77] Although the US have recently replaced their worldwide tax system, an evaluation is not possible at this point in time due to missing data. In 2009, however, the UK already switched from a system of worldwide taxation to a territorial system. We exploit the UK tax reform to learn about the impact of the international tax system on effective tax expenses. We will test the following hypothesis:

H5: The switch from a system of worldwide taxation to a territorial system affects the effective tax expenses of MNCs.

3.3 Data and Research Design

3.3.1 Data and Exploratory Analysis

The main objective of our paper is to provide reliable estimates about the determinants of tax differentials between US and European MNCs. We focus on firms with US or European headquarters listed on the S&P500 or StoxxEurope600 stock market indices, and we consider their consolidated financial information taken from the *Compustat* and *Compustat Global* databases.

Many different measures have been suggested to gauge the effective tax level of a firm. Following a recent stream of literature in accounting, we base our analysis on variations in effective tax rates (ETRs) as ex post measures of tax expenses (e.g., Markle and Shackelford, 2012a, 2012b; Dyreng, Hanlon, and Maydew, 2010; Hanlon and Slemrod, 2009). The data to compute ETRs are taken from the consolidated financial statements.[78] ETR measures the overall tax expenses of a firm. Thus, it reflects numerous choices made by the

[77] E.g., HP is accused of repatriating billions of dollars each year from offshore entities to the US without paying taxes; see *Forbes* (20/09/2012), available at https://www.forbes.com/sites/janetnovack/2012/09/20/senate-report-hits-hp-microsoft-for-offshore-ploys-saving-billions-in-tax/#2b35c9a6229e.

[78] The *ETR* used in this study should not be confused with the effective tax rate as described in Devereux and Griffith (1998) and King and Fullerton (1984), who define it differently as a forward-looking measure.

firm, including tax avoidance or tax planning activities. In our main analysis, we focus on a firm's *GAAP ETR*. According to ASC 740, we define *GAAP ETR* as tax expenses (txt) divided by pre-tax income (pi). We adjust the latter for extraordinary items (xi).[79] See table A1 of the appendix for detailed variable description.

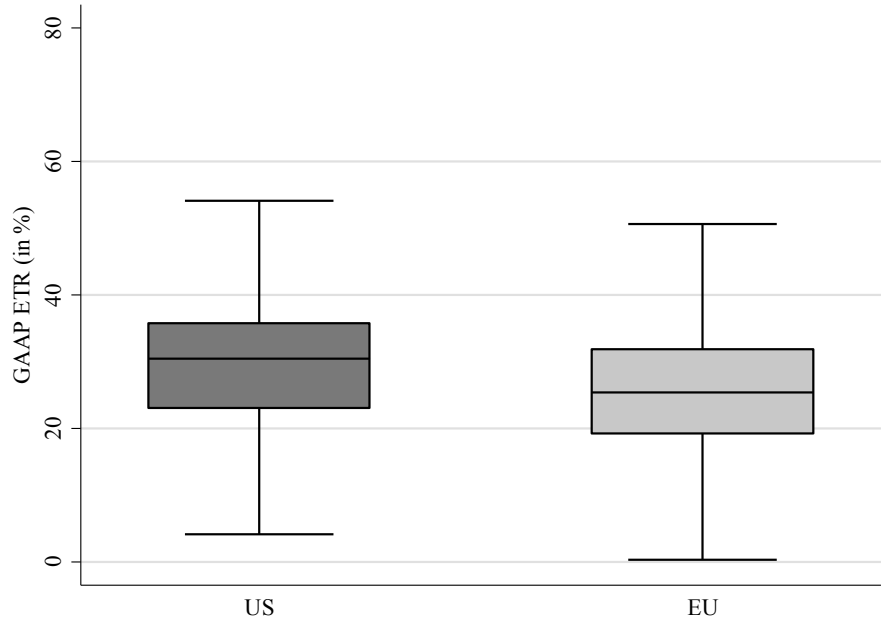
Our base sample includes MNCs that have been listed on either the S&P500 or StoxxEurope600 at least once during the period 1995 to 2015. In sum, 965 US firms and 1,015 European firms for which financial information are reported in *Compustat* or *Compustat Global*, enter our sample (see table A2 of the appendix for more detailed information).

We investigate effective tax differentials between US and European MNCs for different time periods dating back to 1995. However, the recent debate about the aggressive tax planning structures of several MNCs started around 2012.[80] Thus, to gain a first idea about the distribution of US and European *GAAP ETRs*, we have calculated ETRs for the years 2012 to 2015 and display them in figure 1. The statistics suggest that the average *GAAP ETR* of US MNCs equals 28.9 %, which is 2.0 percentage points higher than the mean of the European firms, which is 26.9 %. The median values of 30.5 % for the US MNCs and 25.4 % for the European ones suggest that the distribution of US ETRs is also more left-skewed – implying that a few US MNCs save a lot of taxes but many others face relatively high effective tax payments – compared to the distribution of European ETRs.

[79] We replace missing values in the latter variable by including zeros. We delete a firm-year observation if the numerator or denominator of the ETR is negative, and we generally exclude ETRs with negative values or with values greater than one.

[80] For example, public hearings on aggressive tax planning in the U.S. or the United Kingdom, e.g., U.S. Senate, Permanent Subcommittee on Investigations, Hearing On Offshore Profit Shifting and the U.S. Tax Code (20/09/2012); House of Commons, Committee of Public Accounts (12/11/2012).

Figure 1. GAAP ETR



Notes: Comparison of *GAAP ETR* between US and European MNCs. The figure is based on data for the years 2012 to 2015. A box portrays the interquartile range of the *GAAP ETR* distribution. The horizontal line in the box represents the median.

In additional tests we will also consider *CURRENT ETR, CASH ETR,* and long-run ETR measures although the sample size becomes smaller due to missing data, in particular, of European MNCs.[81] However, in our main analysis, we prefer the *GAAP ETR* because data is available for most firms and the public debate mainly refers to the *GAAP ETR* or its counterpart, the *FOREIGN ETR*.[82]

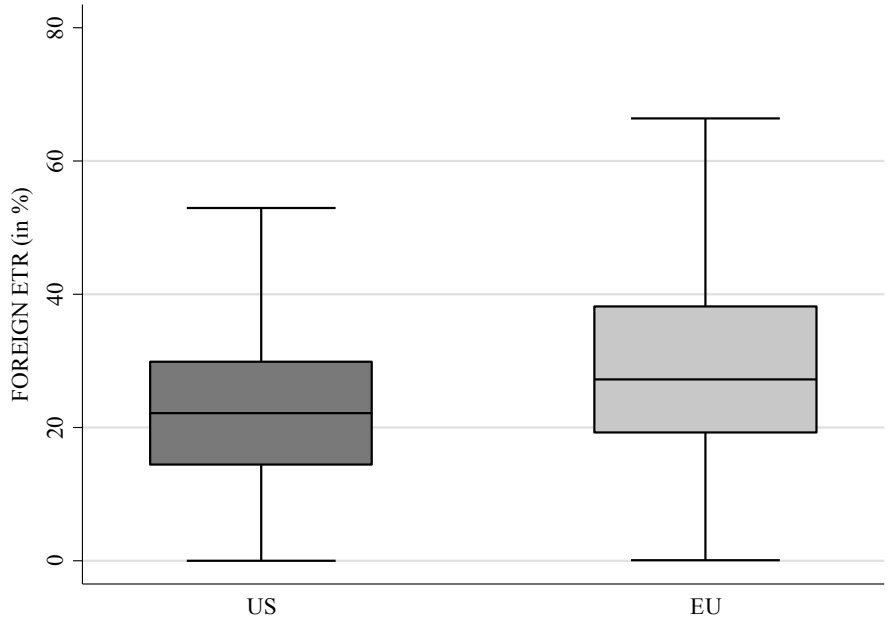
The *FOREIGN ETR* focuses only on tax expenses associated with foreign operations. For US MNCs, the *FOREIGN ETR* is calculated as "foreign taxes" (txfo + txdfo) divided by "foreign income" (pifo). Unfortunately, European MNCs are not obligated to disclose foreign taxes and foreign pre-tax income. Therefore, we approximate the *FOREIGN ETRs* for European MNCs by subtracting domestic taxes and domestic pre-tax income from the overall tax expenses and pre-tax income. We obtain the domestic information for European MNCs by combining ownership information with financial information taken from the *Amadeus*

[81] Moreover, we cannot compute *CASH ETRs* of European firms for years before 2005 due to a lack of data.
[82] E.g., *The Financial Times* (30/08/2016), available at https://www.ft.com/content/3e0172a0-6e1b-11e6-9ac1-1055824ca907.

database.[83] We provide an example of the calculation of the *FOREIGN ETR* of European MNCs in table A3 of the appendix.

We believe that we can calculate comparable measures reasonably well. In particular, *Compustat* reports foreign tax information for very few European firms. Thus, we are able to validate our measure with the reported tax information for a very limited number of firms. The overall good approximation is documented in table A4 of the appendix. Note, moreover, that the second part of our empirical analysis focuses on time-variation and should therefore not be too sensitive to cross-sectional inconsistencies (if there are any).

Figure 2. FOREIGN ETR



Notes: Comparison of *FOREIGN ETR* between US and European MNCs. The figure is based on data for the years 2012 to 2015. A box portrays the interquartile range of the *FOREIGN ETR* distribution. The horizontal line in the box represents the median.

The findings, presented in figure 2, suggest that the distinction between foreign taxes and overall taxes matters: on average, the US *FOREIGN ETR* (23.7 %) is 6.8 percentage points lower compared to the European one (30.5 %), and the whole distribution of US ETRs has substantially shifted to the left (or down, in the boxplots depicted) compared to figure 1.

[83] The ownership data from *Amadeus* are available only for the most recent years, so the group structure information we use is usually from the year 2012.

We can conclude that descriptive statistics do not provide a clear answer to the question of whose tax expenses – US or European – are lower. This obviously depends on how we measure tax expenses. Moreover, firm characteristics, which determine ETRs as well, clearly differ between US and European firms in our sample (although we focus on large public firms). Table A5 of the appendix presents summary statistics on firm variables. The time period of panel A in table A5 of the appendix corresponds to the years 2012 to 2015. A rough comparison between the US and European MNCs suggests that the former are larger and more profitable than the latter. While European firms own more intangible assets, US MNCs face higher R&D expenses. Because previous literature has shown that firm characteristics affect ETRs, systematic differences therein may also bias estimated tax differentials between US and European MNCs.

3.3.2 Empirical Approach

We proceed with a multivariate empirical analysis of the ETR-differential between US and European MNCs. Our identification strategy is based on the following steps. First, we use propensity score matching to identify similar US and European firms. Second, we run panel regressions in which we condition on fixed effects at the level of firm-pairs, which we identify in step 1. To these regressions, we add a number of time-variant variables measured at the level of firms. Third, we focus on firm heterogeneity in explanatory variables to learn about the determinants of tax differentials. Fourth, we exploit policy reforms in a difference-in-differences setting to identify the consequences of particular tax legislation on effective tax expenses.

(i) Finding Firm-Pairs

Let us first define the indicator variable US_i to indicate whether firm i is US based ($US_i = 1$) or European based ($US_i = 0$). Note that the variable is not indexed by time t. We are

primarily interested in how US_i and interactions thereof (interacted with firm- and tax-law variables) affect ETR_{it}. The latter denotes the different measures of effective tax expenses.

The first step involves estimating the probability $\widehat{p_i}$ that firm i is US based. Thus, we specify

$$US_{i,2011} = \beta_1 X_{i,2011} + \varepsilon_{i,2011} \quad (1)$$

to determine the linear index in a probability model.[84] Equation (1) indicates that the probability of being a US firm depends on firm-i-specific determinants, captured by $\boldsymbol{X_{i,2011}}$, where the 2011 index denotes that all variables are measured in 2011. Note that our first regression-based analysis (see below) starts in 2012, which is why we base the estimates of the propensity scores on the year 2011.

The choice of regressors in (1) is based on determinants of tax expenses (e.g., Caliendo and Kopeinig, 2008; Augurzky and Schmidt, 2001). To be specific, we consider $SIZE_i$, defined as the logarithm of total assets (at) of firm i.[85] ROA_i is the return on assets as a proxy for profitability. LEV_i is the liability (dltt)-to-total-assets (at) ratio of i. RD_i captures the R&D expenses (xrd) relative to total assets (at). $INTAN_i$ are the intangible assets (intan) divided by total assets (at).[86]

Estimating (1) produces two vectors of propensity scores: one for the US firms, $\hat{p}^{US}$, and one for the European firms, $\hat{p}^{EU}$. Once we have estimated $\hat{p}^{US}$ and $\hat{p}^{EU}$, we aim at finding so-called *nearest neighbors* for each US unit, i.e., the best comparable match from the group of European firms. We may use ω_i to denote a matched European unit m that is identified as the best match for the US unit i. The best match is determined as $\omega_i = \min_{\{m\}}(|\hat{p}_i^{US} - \hat{p}_m^{EU}|), i \neq m$, where we additionally ensure that only firms operating in exactly the same industry are

[84] We will estimate equation (1) assuming a probit model.
[85] To guarantee comparability, we have used yearly exchange rates to convert total assets to US dollars.
[86] The latter two variables are set equal to zero in case they are missing in our data.

matched.[87] Furthermore, to ensure acceptable matching quality, we require a difference in propensity scores of less than 0.02.[88] Note that our approach produces firm-pairs $\{US_i = 1; US_m = 0\}$, where units (firm-pairs) are very similar (comparable).[89]

In the following, we analyze different periods of time. Because our objective is to analyze pairs of very similar firms over time, we repeat our matching procedure whenever analyzing different time periods and treatment events.

(ii) Estimating Conditional ETR Differentials

To learn about ETR differentials between US and European firms, we suggest the following regression model:

$$ETR_{it} = \alpha_1 US_i + \theta_t + \omega_i + u_{it}. \quad (2)$$

The dependent variable is an ETR measure of firm *i* in year *t*. The first tests focus on the *GAAP ETR*. Additional regressions consider the *FOREIGN ETR* as well. The explanatory variable of interest is the indicator variable US_i, which equals one if the MNC is located in the US and zero if the MNC is located in Europe. The coefficient α_1 measures the tax differential between US and European MNCs, conditional on the pair-(ω_i) and year-(θ_t) fixed effects. Hence, equation (2) allows us to average over all pair-specific differentials, i.e., conditional on the propensity score.

(iii) Different Tax Planning Opportunities

In additional analysis, we can augment equation (2) by firm- and country-specific time-variant regressors that could lead to bias in α_1. In particular, we control for firm characteristics associated with international tax planning opportunities. Moreover, we can analyze whether

[87] According to the Fama and French classification of 17 different industry groups.

[88] According to Austin (2011), the optimal caliper width lies at 20% of the standard deviation of the propensity score, and calipers equal to 0.02 or 0.03 show superior performance.

[89] Note that matching on the propensity score is based on two central assumptions. The first assumption is called ignorability of treatment. The second assumption is the so-called balancing property. The latter assumption is testable.

distinct tax planning opportunities between US and European MNCs exist by introducing interaction terms between firm characteristics and the indicator variable US_i.

(iv) The Effect of Home Country Tax Rules

One particular advantage of the identification approach suggested above is that it allows us to effectively combine the pair-matching with a difference-in-differences approach to analyze the differential impact of tax policy reforms. As described in section 3.2, we consider US and European reforms of CFC legislations, as well as the UK's switch to a territorial tax system.

The difference-in-differences approach ensures that the estimates are not biased by time-constant differences in the treatment and control groups (Caliendo and Kopeinig, 2008; Heckman, Ichimura, Smith, and Todd, 1998).[90] The approach also helps us understand and pin down where possible ETR differentials come from and how these have changed after the reforms of tax rules. Let us define the variable $TREATMENT_i$, which is equal to one if firm *i* is affected by the change in tax legislation, and zero otherwise. Since the reforms we study affect either US firms or European firms, the indicator $TREATMENT_i$ usually captures the location of the MNCs as above. We estimate the following equation:

$$ETR_{it} = \gamma_1 TREATMENT_i + \gamma_2 TREATMENT_i \times POST_t + \theta_t + \omega_i + u_{it}. \qquad (3)$$

In equation (3), $POST_t$=1 denotes the periods of and after a policy reform. The coefficient γ_2 is the treatment effect we are interested in, as it measures the differential response of a treated firm *i* relative to a firm that is not affected by a reform.

[90] Note that our regressions are still based on a pair-matched sample. We thereby ensure that the common trend assumption in a difference-in-differences setting is not an issue.

3.4 Comparing Effective Tax Expenses: US vs. European Firms

3.4.1 Conditional Comparisons

We start with a comparison of ETR measures of US and European firms for the most-recent years available in our data (2012 to 2015). Before we do so, we need to estimate propensity scores and find the best matching pairs of US and European firms. The matching is based on the year before our panel analysis starts, *i.e.*, propensity scores are calculated for the year 2011.

Table 1 suggests that the matching removes most of the bias in firm characteristics between US ($US_i = 1$) and European ($US_i = 0$) firms. The nearest neighbor matching (with a 2 % caliper as suggested above) finds 352 matched pairs (see panel B in table A5 of the appendix for descriptive statistics). The matching produces very reasonable results. For example, the European-based *SAP SE* is matched to the US-headquartered *Oracle Corp.*

Table 1. Nearest Neighbor Matching, Balancing Property (2011)

Nearest Neighbor 1:1		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
SIZE	Unmatched	2.5143	2.2614	15.9		2.66	0.008
	Matched	2.5032	2.4437	3.7	76.5	0.49	0.627
ROA	Unmatched	0.1046	0.0846	25.8		4.35	0.000
	Matched	0.0844	0.0892	-6.2	76.1	-0.92	0.359
LEV	Unmatched	0.2421	0.2496	-4.2		-0.71	0.475
	Matched	0.2526	0.2538	-0.7	83.7	-0.09	0.928
RD	Unmatched	0.0192	0.0148	11.8		1.98	0.048
	Matched	0.0142	0.0177	-9.4	20.5	-1.29	0.197
INTAN	Unmatched	0.2177	0.2318	-6.8		-1.15	0.251
	Matched	0.2317	0.2180	6.6	2.5	0.86	0.391

Notes: Balancing property tests. The tests are based on observations from the year 2011. The matching applies one-to-one nearest neighbor matching, which requires a difference in propensity scores of less than 0.02.

Based on the matched sample, we then run equation (2). The results are presented in table 2. Columns (1) to (3) of table 2 are regressions where the dependent variable corresponds to *GAAP ETR*. Column (1) reports a specification that includes only year and pair fixed effects. The coefficient of interest, *US*, is positive and statistically significant.

Table 2. Regression Analysis, ETR Differentials

Variables	GAAP ETR			FOREIGN ETR		
	1	2	3	4	5	6
US	0.0209***	0.0221***	-0.0328**	-0.0961***	-0.0961***	-0.0696*
	(0.0059)	(0.0061)	(0.0146)	(0.0141)	(0.0144)	(0.0392)
SIZE		-0.0059	-0.0098*		0.0042	0.0067
		(0.0052)	(0.0052)		(0.0102)	(0.0103)
ROA		-0.2457***	-0.2405***		-0.1490	-0.1460
		(0.0868)	(0.0852)		(0.1890)	(0.1890)
LEV		-0.0195	-0.0196		-0.0514	-0.0478
		(0.0222)	(0.0215)		(0.0554)	(0.0547)
RD		-0.2450	-0.2810		-0.0067	0.0141
		(0.1860)	(0.1750)		(0.3360)	(0.3470)
INTAN		0.0295	0.0292		0.0376	0.0386
		(0.0202)	(0.0203)		(0.0546)	(0.0538)
STR			0.4832***			-0.2220
			(0.1150)			(0.2980)
Year FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓	✓
N	2,314	2,314	2,314	1,101	1,101	1,101
Adj. R^2	0.283	0.288	0.300	0.364	0.364	0.364

Notes: Regressions are based on a matched sample, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2015 (panel B) are included. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

We add firm characteristics in column (2). While the matching procedure has aligned firm characteristics of our firm-pairs in the benchmark year, our results show that changes in *SIZE, ROA* and *LEV* may have an impact on the effective tax expenses, even though that impact is either almost zero (*SIZE*) or insignificant (*SIZE* and *LEV*). To control for profit shifting possibilities, we further include *RD* and *INTAN*. The effect of *RD* on *GAAP ETR* is negative but (statistically) insignificant. The coefficient for the dummy *US* suggests that the *GAAP ETRs* of US firms are approximately 2 percentage points higher compared to European ones, which confirms our hypothesis *H1a* and the findings of our unconditional comparison in section 3.3.1.

In specifications (4) to (6) of Table 2, we consider the *FOREIGN ETR* as the dependent variable. Our results confirm the findings of the descriptive analysis in section 3.3.1 that US MNCs pay less foreign taxes compared to their European peers: being a US firm suggests an almost 10 percentage points lower *FOREIGN ETR*. This means that an unconditional

comparison even underestimates the tax differential. Thus, when we focus on foreign taxes, we can confirm *H1b*.[91]

3.4.2 Influence of the Home Country Tax Rate

Many argue that it is mainly the high home country tax level faced by US MNCs during the considered sample period that affects US firms' competitiveness. We therefore add the statutory tax rate (*STR*) of an MNC's home country in column (3) of table 2. The difference in statutory corporate tax rates is substantial. Whereas the mean tax rate in the home countries of European MNCs is 27.5 % in our sample period, the US corporate tax rate is significantly higher.[92] Note that the European MNCs are headquartered in different countries. Within the European sample, statutory tax rates vary across home countries and over time. Rates range from approximately 12.5 % (as, for example, in Ireland,) to almost 39 % (as, for example, in France, where a statutory tax rate of 38.9 % applies).

As expected, the home country tax rate is positively related to *GAAP ETR*. The coefficient can be interpreted. It suggests that a 1 percentage point higher *STR* increases the effective tax rate by about 0.5 percentage point. Given that we measure total worldwide tax payments on the left-hand side, this is quite substantial. Conditional on the statutory tax level, the sign of the *US* coefficient becomes negative. That is, controlling for the different levels of the statutory tax rate, the *GAAP ETRs* of US MNCs are approximately 3.3 percentage points lower compared to those of European MNCs.

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[91] Comparing our measurement of *FOREIGN ETRs* with the available *Compustat FOREIGN ETRs* for a limited number of European firms indicates that our approximation is very close to and just slightly below the reported *FOREIGN ETR* for European firms during the very recent years. Overall, this suggests that the tax differential in terms of *FOREIGN ETRs* between US and European firms may potentially be underestimated (see table A4 of the appendix).

[92] See panel B of table A5 of the appendix. The statutory tax rates were collected from the worldwide corporate tax summaries of PwC, KPMG, and EY and from the OECD statistics website (http://stats.oecd.org/). The US statutory tax rate is the combined corporate income tax rate taken from the OECD statistics website.

A comparison of the results shown in columns (1) to (2) and (3) suggests that the relatively high US effective tax burden we find in unconditional comparisons is explained by the differences in statutory tax rates. Hence, the fact that US firms faced a high statutory tax burden at home during the sample period might be interpreted as a competitive disadvantage for US firms. Since we are interested in the tax differential that is associated with being a US firm relative to being a European firm, conditional on tax law and observable firm characteristics, our estimates suggest that the *GAAP ETR* of a US firm is approximately 3.3 percentage points below the *GAAP ETR* of a comparable European firm. At this point, we may interpret the negative *US* coefficient as an indicator capturing the tax avoidance behavior of US MNCs to compensate for the higher home country tax rate. Thus, the findings support *H2*.

In specification (6) of Table 2, we consider the *FOREIGN ETR* as a dependent variable. The result for the tax differential measured by the *FOREIGN ETR* is unaffected by the additional consideration of the home country tax level. The coefficient for the dummy *US* confirms a 7 percentage points lower *FOREIGN ETR* of US MNCs compared to their European peers.

3.4.3 Robustness Checks

Table 3 presents the results of several robustness checks. All specifications in column (1) include fixed effects only, whereas the regressions in column (2) include the full set of our control variables. We report only results for the dummy *US*, which captures the ETR differentials between US and European firms.

Table 3. Additional Sensitivity Checks (Treatment: US)

	Coeffcient on US	
	1	2
(1) Probit: Exact matching by industry	0.0209***	-0.0328**
	(0.0059)	(0.0146)
(2) Probit: Only Year FE	0.0227***	-0.0439***
	(0.0076)	(0.0142)
(3) Probit: Year FE and Industry FE	0.0223***	-0.0363***
	(0.0073)	(0.0137)
(4) Probit: Year-Pair-FE	0.0240***	-0.0357*
	(0.0082)	(0.0199)
(5) Probit: No Exact Matching	0.0143***	-0.0380***
	(0.0053)	(0.0122)
(6) Probit: 2nd order polynomial	0.0262***	-0.0263*
	(0.0062)	(0.0136)
(7) Probit: 3rd order polynomial	0.0209***	-0.0268*
	(0.0064)	(0.0147)
(8) Probit: Size interactions	0.0281***	-0.0328**
	(0.0065)	(0.0142)

Notes: Regressions are based on matched samples, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2015 are included. Unless otherwise described, year and firm-pair fixed effects are included in all specifications. Regressions in column (2) include the control variables *SIZE, ROA, LEV, RD, INTAN*, and *STR*. The dependent variable is *GAAP ETR* in specifications (1) to (8). Specification (1) repeats our basis regression (Panel B). Specifications (2) to (4) are based on Panel B and differ due to the use of different fixed effects, while in specifications (5) to (8), different matching procedures apply. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

The dependent variable is still the *GAAP ETR*, but the specifications differ in the use of different fixed effects and the matching procedures applied. While row (1) repeats our benchmark results, we consider only year fixed effects in row (2) and add industry fixed effects in row (3). Specification (4) considers year-pair fixed effects. The results in row (5) are based on a similar matching as the benchmark matching, with the only difference being that we do not require an exact industry matching of firm-pairs. Rows (6) to (8) consider higher-order polynomials of explanatory variables as well as interaction terms between size and explanatory variables when computing propensity scores.

All in all, the variations shown in table 3 suggest that our approach produces quite reliable estimates. If we control for the home country tax level, such as in all specifications in

column (2) of table 3, our results always suggest that the remaining tax differential between US and European firms is negative, i.e., US firms have less tax expenses conditional on the higher US corporate tax rate.

3.4.4 Additional Analyses Using Different ETR Measures

In additional analyses in table 4, we consider alternative definitions of the ETR measure as proposed by earlier literature (for an overview see chapter 2 of this thesis). In row (1) and (2) of table 4 we consider the *CURRENT ETR* and the *CASH ETR*, respectively. Moreover, in rows (3) to (5) we consider long-run ETR specifications to mitigate a potential year-to-year volatility in the respective tax measure (Dyreng, Hanlon, and Maydew, 2008). We compute the long-run ETRs over a period of three years.

Table 4. Alternative ETR Measures (Treatment: US)

	Coefficient on US	
	1	2
(1) Probit, *CURRENT ETR*:	-0.0193**	-0.0648***
Exact matching by industry	(0.0075)	(0.0145)
(2) Probit, *CASH ETR:*	-0.0367***	-0.0958***
Exact matching by industry	(0.0084)	(0.0190)
(3) Probit, *GAAP ETR3:*	0.0310***	-0.0208*
Exact matching by industry	(0.0054)	(0.0120)
(4) Probit, *CURRENT ETR3*:	-0.0320***	-0.1030***
Exact matching by industry	(0.0083)	(0.0174)
(5) Probit, *CASH ETR3*:	-0.0211***	-0.0847***
Exact matching by industry	(0.0075)	(0.0158)

Notes: Regressions are based on matched samples, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2015 are included. Year and firm-pair fixed effects are included in all specifications. Regressions in column (2) include the control variables *SIZE, ROA, LEV, RD, INTAN*, and *STR*. The dependent variables in specifications (1) and (2) are *CURRENT ETR* and *CASH ETR*, respectively. The dependent variables in specifications (3), (4), and (5) are the long-run specifications over three years of *GAAP ETR, CURRENT ETR,* and *CASH ETR*, respectively. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

We use the same matching procedure as in section 3.4.1 and again estimate the tax differentials between US and European MNCs, here in terms of *CURRENT ETR* and *CASH ETR,* for the matched sample. Specifications in column (1) include fixed effects only, whereas

the regressions in column (2) include the full set of our control variables. Again, we report results for the dummy *US*, which captures the ETR differential between US and European firms.

Interestingly, using the *CURRENT ETR* and *CASH ETR* as tax measures (row (1) and (2) of table 4), our results suggest that the effective tax expenditures of US MNCs are *lower* than those of European MNCs. This finding contrasts with our results considering the *GAAP ETR*. Moreover, if we control for home country tax rates (column (2) of table 4), the tax differentials between US and European firms are larger for both *CURRENT ETR* and *CASH ETR* compared to our results for the *GAAP ETR*. While our comparison using the *GAAP ETR* suggests that US MNCs had higher tax expenses than their European peers prior to the US tax reform, a comparison using the two alternative measures clearly suggests that US MNCs had lower tax expenditures already prior to the US tax reform in 2017. The results for long-run specifications of the ETR measures in rows (3) to (5) of table 4 further confirm this finding.[93] Moreover, our results correspond well with findings by previous literature. While PricewaterhouseCoopers (2011) suggests higher *GAAP ETRs* for US firms than for European firms, Avi-Yonah and Lahav (2012) find lower *CURRENT ETRs* for US firms and Markle and Shackelford (2012a) also find lower *CASH ETRs* for US firms. Further, the findings are in line with the prior results of chapter 2 of this thesis.

Consequently, the definition of the tax measure affects the conclusions that can be drawn from a comparison between US MNCs and their European competitors. The most important conceptual difference between the *GAAP ETR* and the alternative measures (in particular, the *CURRENT ETR*) is the exclusion of deferred tax expenses. Therefore, the findings suggest that the higher *GAAP ETR* of US MNCs compared to their European peers can be attributed to higher deferred tax expenses. Under the US worldwide tax system, foreign

[93] Please note that we do not consider the long-run specification of the *FOREIGN ETR*. In particular, for European MNCs the sample size becomes too small to establish reliable estimates.

income is one potential source of deferred tax expenses that might explain the higher *GAAP ETR* of US MNCs.[94] Therefore, the disadvantage of US MNCs measured by *GAAP ETR* must be interpreted carefully, in particular when taking into account the recent devaluation of deferred tax liabilities due to the significant US tax rate cut.

3.5 Explaining the Tax Differentials between US and European MNCs

In additional analyses, we attempt to explain the identified tax differentials between US and European MNCs. First, we test whether additional tax planning opportunities associated with certain firm characteristics can explain the tax differential. Second, we investigate the consequences of CFC legislation, since implementing CFC rules is discussed at the policy level as a central countermeasure against base erosion and profit shifting. Third, we analyze the impact of the home country tax system for foreign income.

3.5.1 Does Tax Planning Associated with Firm Characteristics Explain Tax Differentials?

We proceed with a test of *H3* and investigate whether US MNCs have enhanced tax planning and profit shifting opportunities. Using the same sample of matched firm-pairs as in section 3.4, we additionally interact firm variables with the *US* dummy. Of particular interest is a potential differential response of ETRs to proxies of firm-level profit shifting opportunities. The variables *RD* and *INTAN* are often interpreted as proxies for profit shifting opportunities. MNCs with particularly high R&D expenses are able to shift more profits and taxes (which is

[94] However, some US firms classified their foreign income as permanently reinvested earnings and thus, avoided deferred tax expenses (see discussion in chapter 2 of this thesis). The case study in section 2.4 of this thesis demonstrates that US MNCs report lower (higher) *GAAP ETRs* when undistributed foreign earnings are (not) classified as permanently reinvested outside the US. However, only one of the three selected US MNCs of the case study classifies all its undistributed foreign earnings as permanently reinvested outside the US. While the other MNCs of the case study do not classify all their undistributed foreign earnings as permanently reinvested, they report higher deferred tax expenses and thus higher *GAAP ETRs* (see section 2.4.2 of this thesis).

in line with Grubert, 2003; Harris, 1993). Thus, we interact these two variables with the *US* dummy. Table 5 presents the results.

Table 5. Firm Characteristics

Variables	GAAP ETR			FOREIGN ETR		
	1	2	3	4	5	6
US	-0.0328**	-0.0254*	-0.0425**	-0.0696*	-0.0475	-0.0370
	(0.0146)	(0.0150)	(0.0167)	(0.0392)	(0.0381)	(0.0419)
RD	-0.2810	-0.0813	-0.2730	0.0141	0.3870	-0.0200
	(0.1750)	(0.1740)	(0.1760)	(0.3470)	(0.2740)	(0.3360)
US x RD		-0.5250**			-1.0620**	
		(0.2370)			(0.4100)	
INTAN	0.0292	0.0233	0.0076	0.0386	0.0190	0.1160
	(0.0203)	(0.0204)	(0.0251)	(0.0538)	(0.0542)	(0.0765)
US x INTAN			0.0395			-0.1230
			(0.0326)			(0.0906)
Control Variables	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓	✓
N	2,314	2,314	2,314	1,101	1,101	1,101
Adj. R^2	0.300	0.303	0.301	0.364	0.371	0.366

Notes: Regressions are based on a matched sample, where MNCs are headquartered either in the US or in Europe; years from 2012 to 2015 (panel B) are included. Year and firm-pair fixed effects are included in all specifications. Regressions include the control variables *SIZE, ROA, LEV,* and *STR*. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

Columns (2) and (5) support *H3*: high *RD* values enable US MNCs to reduce their *GAAP ETR* and *FOREIGN ETR* substantially more compared to European MNCs. A one standard deviation higher value of *RD* enables US MNCs to decrease their *GAAP ETR* by approximately 1.9 percentage points more than the European counterparts. The advantage is even higher if we consider the *FOREIGN ETR*: an increase of one standard deviation in *RD* leads to a 3.8 percentage points lower *FOREIGN ETR* of US MNCs compared to their European peers. Note that *RD* does not have an effect on the *ETRs* of European MNCs (the estimated coefficient on *RD* becomes insignificant).

Because the *US* dummy becomes smaller in column (2) – or even insignificant, as in column (5), compared to our base specifications, while the interaction terms with *RD* are negative – we can say that one channel through which lower effective taxes materialize is the

tax avoidance channel associated with R&D expenditures. Thus, we may conclude that a substantial part of the negative ETR differential between US and European firms can be attributed to enhanced profit shifting opportunities associated with R&D expenses. Moreover, we should mention that specifications (2) and (5) achieve the highest values in the adjusted R^2, which suggests that the variable *RD* is highly relevant in this context. All in all, the findings support *H3*, as tax differentials are particularly large if profit shifting opportunities (measured by *RD*) are large as well.

We do not find such an effect for the variable *INTAN*. However, we interpret this finding cautiously. The amount of intangible assets might be sometimes a crude proxy for a firm's profit shifting opportunities because R&D expenses are not always capitalized and self-generated intangibles are not recognized in the balance sheet.

3.5.2 Does Home Country CFC Legislation Explain Tax Differentials?

We further explore whether ETR differentials are related to home country tax rules. Differences in tax legislation at the location of the headquarters may explain differences in the opportunities to shift profits.

Let us first focus on CFC rules. In particular, ineffective CFC rules might explain the influence of our proxies for profit shifting on tax rate differentials. Since we do not have a measure for the effectiveness of CFC rules, we make use of two important changes in CFC rule application. As described in section 3.2, European CFC rule application has been adjusted since the 2006 ECJ "Cadbury Schweppes" judgment, and US Subpart F legislation has changed in a way that has facilitated tax avoidance since the CTB introduction in 1997.

As before, we base our analysis on samples of matched firm-pairs of US and European MNCs. To evaluate the effect of the policy changes, we will compare time periods before and after the two important tax reforms. To mitigate the problem that both events could influence

tax expenses and to be better able to separate the effects, we focus on the time period 2002 to 2015 to investigate the ECJ judgment and on the years 1995 to 2003 for the CTB introduction.

(i) Evaluating "Check the Box"

In this section, we test whether the US CFC rules have become less effective in the aftermath of the CTB introduction. The $TREATMENT^{US}$ variable indicates whether an MNC is located in the US ($TREATMENT^{US}$ =1) and has been affected by the CTB introduction. Again, we use propensity score matching to generate pairs of similar US and European MNCs (see table A6 of the appendix for the balancing of covariates). Based on the matched samples and observations from 1995 to 2003, we estimate equation (3) as described in section 3.3.2. Table 6 presents the results.

Table 6. Consequences of Check the Box Introduction

Variables	GAAP ETR				
	1	2	3	4	5
$TREATMENT^{US}$ (T^{US})	0.0295***	0.0316***	0.0300***	0.0388***	0.0275***
	(0.0066)	(0.0057)	(0.0060)	(0.0065)	(0.0075)
T^{US} x POST	-0.0132**	-0.0174***	-0.0457***	-0.0422***	-0.0375***
	(0.0061)	(0.0060)	(0.0070)	(0.0072)	(0.0079)
T^{US} x RD				-0.5860***	
				(0.1480)	
T^{US} x POST x RD				-0.3580**	
				(0.1460)	
T^{US} x INTAN					0.0257
					(0.0363)
T^{US} x POST x INTAN					-0.0642**
					(0.0317)
Control Variables	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓
N	6,160	5,868	4,849	4,849	4,849
Adj. R^2	0.335	0.281	0.365	0.371	0.365

Notes: Regressions are based on matched samples, where MNCs are headquartered either in the US or in Europe. The data of column (1) refer to a matching based on the year 1996, and the year of treatment is 1997. The data of column (2) refer to a matching based on the year 1998, and the year of treatment is 1999. The data of columns (3) to (5) refer to panel C. Control variables include *SIZE, ROA, LEV, RD, INTAN,* and *STR*. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

Specification (1) of table 6 considers 1997 as the year of treatment. Propensity score estimates are based on the year 1996. However, there is plenty of anecdotal evidence, regularly coming from the exchange of arguments between IRS employees and international tax lawyers that the widespread use of CTB for tax planning activities was delayed.[95] We therefore consider 1999 and 2002 as alternative treatment years in specifications (2) and (3); matching is then based on data from 1998 and 2001, respectively.

We consider the *GAAP ETR* as the dependent variable. All specifications in the table control for the usual set of firm characteristics, pair-effects, as well as aggregate year effects. The differential impact we are interested in is the estimated coefficient on $TREATMENT^{US}$ *x POST*. Across all specifications, we find a negative treatment effect. The treatment effect increases in absolute values if we consider 1999 (column (2)) or even 2002 (column (3)) as treatment years. Thus, our findings support the anecdotal evidence from discussions between IRS employees and international tax lawyers arguing that there was some delay in using CTB for tax avoidance.

The point estimate of specification (3) suggests that US firms reduce their *GAAP ETR* by 4.6 percentage points after the introduction of the CTB option compared to their European counterparts. Our estimated effect of a 4.6 percentage points decline in the *GAAP ETR* in response to the CTB option is close to the finding by Dyreng, Hanlon, Maydew, and Thornock (2017), who suggest a decline of 3.9 percentage points in the US MNC's *CASH ETRs*.[96] Hence, it happened at this point in time when the change in CFC legislation allowed US MNCs to pay less taxes compared to their European peers (conditional on *STR*). In further untabulated tests,

[95] For further information, see Dunbar and Duxbury (2015).

[96] Moreover, Dunbar and Duxbury (2015) suggest a decline of 9 percentage points in the US MNCs' *FOREIGN ETRs*. Because *Amadeus* only provides financial data for the last ten years, we are unable to compute the *FOREIGN ETR* for European MNCs prior to 2003.

we repeat our regressions with *CURRENT ETR* as the dependent variable and obtain an effect very close to our baseline effect.

We further test for specific channels or heterogeneity in treatment effects by including interaction terms between $TREATMENT^{US}$, *POST*, and firm-specific proxies for profit shifting. As argued above, as well as in previous contributions, high *RD* and *INTAN* values facilitate profit shifting to a significant extent. Columns (4) and (5) are based on the same sample as column (3), and they correspond to panel C of table A5. Specification (4) of table 6 confirms a negative and significant treatment effect ($TREATMENT^{US}$ x *POST*). In addition, we include the interaction term between the treatment indicator and our proxy for profit shifting opportunities, *RD*. The coefficient of the interaction between $TREATMENT^{US}$, *POST*, and *RD* is negative and statistically significant. The same pattern is found for the interaction with *INTAN* in column (5). All these results are consistent with the hypothesis that the CTB introduction affects those firms that can respond to changes in the application of CFC rules. If a firm lacks the capacity for international tax planning, a more-lenient application of CFC rules should, ceteris paribus, be less relevant.

To conclude, two findings are particularly interesting. First, the basic ETR-differential between US and European firms was positive during the considered period 1995 to 2003. Second, given the magnitude of the treatment effect, the CTB introduction makes the positive tax differential vanish or even turn negative.

(ii) Evaluating Cadbury Schweppes

To identify possible effects of the ECJ Cadbury Schweppes judgment, we focus on European MNCs that have been affected by the judgment. Because not all European countries had implemented CFC rules before 2006, and therefore, MNCs from these countries have not been affected by the Cadbury Schweppes judgment, we exclude MNCs headquartered in

European countries where no CFC rule was implemented in 2005. Table A7 of the appendix provides information about the respective countries.

Note that the treatment indicator $TREATMENT^{EU}$ now refers to European firms, which we indicate by the superscript *EU*. We use the year 2005 to estimate the propensity score, i.e., one year before the 2006 ECJ judgment. Moreover, Spain and France anticipated the ECJ judgment and changed their CFC rules already in 2004 and 2005. Because anticipation effects in these two countries could potentially blur the precise identification of the Cadbury Schweppes effect, we use the years 2003 and 2004 to estimate the propensity score for those observations. The balancing of covariates is clearly not an issue, as is documented in table A8 of the appendix.[97] The matching creates 324 pairs of US and European MNCs, and we consider all observations of these firms from 2002 to 2015 (see panel D in table A5 of the appendix for descriptive statistics). The results of the pair fixed effects regressions are shown in table 7.

[97] Note that the outcome equations (here, equation (3)) always condition on covariates used in the propensity score estimates. The balancing property should, in any case, never be an issue.

Table 7. The Consequences of Cadbury Schweppes

Variables	GAAP ETR			FOREIGN ETR		
	1	2	3	4	5	6
$TREATMENT^{EU}$ (T^{EU})	0.0289***	0.0218**	0.0181	0.0866***	0.0692***	0.0807***
	(0.0085)	(0.0090)	(0.0111)	(0.0197)	(0.0217)	(0.0247)
T^{EU} x POST	-0.0256***	-0.0223***	-0.0023	-0.0357**	-0.0306*	-0.0168
	(0.0068)	(0.0074)	(0.0099)	(0.0152)	(0.0163)	(0.0192)
T^{EU} x RD		0.4940***			0.8820**	
		(0.1580)			(0.3490)	
T^{EU} x POST x RD		-0.2780**			-0.2520	
		(0.1190)			(0.3530)	
T^{EU} x INTAN			0.0697			0.0550
			(0.0472)			(0.0785)
T^{EU} x POST x INTAN			-0.1250**			-0.1020
			(0.0490)			(0.0648)
Control Variables	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓	✓
N	7,189	7,189	7,189	3,130	3,130	3,130
Adj. R^2	0.256	0.257	0.259	0.314	0.316	0.314

Notes: Regressions are based on a matched sample, where MNCs are headquartered either in the US or in Europe. The data refer to panel D, which includes firms from the US and firms from European countries with existing CFC rules in 2005. Year and firm-pair fixed effects are included in all specifications. Regressions include the control variables *SIZE, ROA, LEV, RD, INTAN,* and *STR*. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

The negative treatment effect indicates that the ECJ judgment facilitated saving taxes. Quantitatively, the treatment effect is quite substantial (-2.6 percentage points). Hence, our estimates suggest that the ECJ judgment has allowed European firms to partially reduce the initial tax differential vis-á-vis US MNCs. Nevertheless, the responses of US MNCs to the CTB introduction were stronger than those of European MNCs to the Cadbury Schweppes judgment.

As before, we expect a stronger effect of the ECJ judgment if the activities of the MNCs facilitate profit shifting. We find a more pronounced treatment effect in columns (2) and (3) of table 7 for those firms that have more shifting opportunities associated with R&D expenses and intangible assets. In columns (4) to (6) of table 7, we consider the *FOREIGN ETR* as a dependent variable and repeat the previous regressions. The coefficient on $TREATMENT^{EU}$ x *POST* is negative and statistically significant (column (4)). It suggests that a laxer CFC practice allows European MNCs to avoid taxes, which shows in a 3.6 percentage

points lower *FOREIGN ETR*. While the coefficients of the interactions between $TREATMENT^{EU}$, *POST*, and *RD* or *INTAN* are negative in specifications (5) to (6), the estimated coefficients are no longer significant. The reason for this may be that the sample size is approximately half that using the *GAAP ETR*.

Additional unreported tests confirm our results. One such test excludes Spanish and French MNCs, as these countries anticipated the ECJ judgment. In another test, we focus on the years around the ECJ judgment (2004 to 2007), and again, we obtain similar results. In a further robustness check, we repeat the difference-in-differences approach based on the StoxxEurope600 MNCs as the treatment group and domestic firms from the same countries as the control group. The results show similar and significant coefficients for the interaction term. Moreover, we find similar results regarding *CURRENT ETR* as the dependent variable.

In additional untabulated placebo-type tests, we consider European MNCs from European countries that had not implemented a CFC rule prior to the Cadbury Schweppes judgment. The tax planning of these firms should be unaffected by the ECJ judgment. While this reduces the number of observations substantially, the results are still based on 88 matched firm-pairs of European and US MNCs, which we observe over time. Results for the relevant estimate of the $TREATMENT^{EU}$ x *POST* interaction are insignificant. Since we would expect that firms from countries where no CFC rules are implemented are unaffected by the Cadbury Schweppes judgment, this finding supports the reasoning that the significant responses found before are indeed related to the ECJ's judgment.[98]

3.5.3 Does Home Country Taxation of Foreign Income Explain Tax Differentials?

An additional feature of a home country tax system is the taxation of foreign income. The fundamental US tax reform has replaced the worldwide tax system by a territorial system.

[98] We confirm our results when considering a shorter time span around the Cadbury Schweppes judgment (2004 to 2007), and when we exclude the years of the financial crisis (2008 and 2009).

We, however, exploit the 2009 switch from a system of worldwide taxation to a territorial system in the UK to learn about this issue. Based on the same basic approach as above, we first define MNCs headquartered in the UK as the group of treated firms ($TREATMENT^{UK}$), and US MNCs as the control group. The matching is based on the year 2008 and leads to 97 pairs (see table A9 of the appendix for the balancing of covariates). The following regressions consider observations of these 97 pairs from 2006 to 2015 (see panel E of table A5 of the appendix for descriptive statistics).

Table 8. Consequences of Abolishment of System of Worldwide Taxation

Variables	GAAP ETR				FOREIGN ETR			
	1	2	3	4	5	6	7	8
$TREATMENT^{UK}$ (T^{UK})	-0.0572*	-0.0687**	-0.0537*	0.0040	-0.0217	-0.0319	-0.0187	-0.0604
	(0.0300)	(0.0303)	(0.0313)	(0.0124)	(0.0758)	(0.0760)	(0.0804)	(0.0382)
T^{UK} x POST	-0.0237*	-0.0259*	-0.0313*	-0.0272*	0.0235	0.0247	0.0129	0.0313
	(0.0123)	(0.0133)	(0.0173)	(0.0150)	(0.0290)	(0.0308)	(0.0392)	(0.0381)
T^{UK} x RD		1.6330***				1.0090*		
		(0.3340)				(0.5860)		
T^{UK} x POST x RD		0.2450				0.1160		
		(0.2560)				(0.6820)		
T^{UK} x INTAN			-0.0124				-0.0100	
			(0.0533)				(0.1190)	
T^{UK} x POST x INTAN			0.0301				0.0452	
			(0.0381)				(0.1140)	
Control Variables	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
Pair FE	✓	✓	✓	✓	✓	✓	✓	✓
N	1,668	1,668	1,668	1,488	916	916	916	502
Adj. R^2	0.227	0.247	0.226	0.240	0.335	0.336	0.334	0.180

Notes Regressions in columns (1) to (3) and (5) to (7) are based on a matched sample, where MNCs are headquartered either in the US or in Europe. The data in these columns refer to panel E. Regressions (4) and (8) are based on a matched sample including MNCs headquartered either in the UK or in the remaining European countries (panel F). Control variables include *SIZE, ROA, LEV, RD, INTAN,* and *STR*. Robust standard errors clustered by firms are shown in parentheses. *, **, and *** indicate significance at the level of 10 %, 5 %, and 1 %, respectively.

Table 8 provides the results of our regression analysis. The main variable of interest is the interaction term between $TREATMENT^{UK}$ and *POST*, which equals one for MNCs headquartered in the UK in 2009, and all following years. The coefficient in column (1) indicates that UK MNCs reduced their *GAAP ETR* by 2.4 percentage points after the switch to a territorial tax system.[99] The recent US switch to a territorial system may have even a bigger effect, as the US statutory tax rate (39 %) before the reform was more than 10 percentage points higher than the UK (28 %) one at the time of the reform.

The worldwide tax system affects the tax burden on repatriated foreign profit and might reduce incentives for international tax avoidance. However, the additional home country tax can be deferred if foreign profits are reinvested abroad. In columns (2) and (3), we test for specific channels or heterogeneity in treatment effects by including interaction terms between $TREATMENT^{UK}$, *POST*, and firm-specific proxies for profit shifting opportunities. We do not find any statistically significant effects, neither with *RD* nor with *INTAN* as proxies for profit shifting opportunities.

The latter finding deviates from the conclusion of Dyreng and Markle (2016), who suggest that adopting a territorial tax system would increase (outbound) income shifting activities. In contrast to Dyreng and Markle (2016), we do not use a proxy to analyze the influence of a territorial tax system but instead are able to analyze the effect of a policy change (UK tax reform). Our results are reasonable given anecdotal evidence[100] and given our findings in section 3.5.1, suggesting that US firms engaged in and benefited from profit shifting activities, although the US applied a worldwide tax system during the considered sample period.

In columns (5) to (7) of table 8, we consider the *FOREIGN ETR* as a dependent variable and repeat the previous regressions. The result is clear: there is no differential impact of the

[99] Together with the switch to the territorial tax system the UK lowered its corporate statutory tax rate by 2 percentage points. We control for that change by including the statutory tax rates (*STR*) into our regressions.
[100] See the example of HP in section 3.2 (footnote 77).

reform with respect to the UK's switch from worldwide to territorial. This finding confirms the previous result that foreign tax avoidance is not significantly affected by the home country taxation of foreign income.

In columns (4) and (8) of table 8, we present the results of an alternative comparison. We run regressions based on a matched sample of similar UK MNCs and MNCs headquartered in the remaining (non-UK) European countries (see panel F in table A5 of the appendix for descriptive statistics and table A10 of the appendix for the balancing of covariates of the respective matching). In line with the previous results, we find a negative treatment effect of the UK tax reform with a point estimate of -2.7 if the *GAAP ETR* is the dependent variable. Again, we do not find any effect for the *FOREIGN ETR*.

Overall, our results confirm a decrease in tax expenses after the home country (here, the UK) has switched from a worldwide to a territorial system of taxation. This supports *H5*. Our results also suggest that the effect should be attributed to the abolishment of additional home country taxes if foreign income is repatriated, while we find no evidence that firms with enhanced profit shifting opportunities respond more (or less) to the switch to a territorial system. Moreover, the *FOREIGN ETR* of UK MNCs was unaffected by the reform.

3.6 Conclusion

The objective of this paper is to produce reliable estimates on the tax expenses of US MNCs and their European peers. By applying matching techniques, we first create pairs of very similar US and European MNCs. Based on these matched pairs, we find, for the most recent years of 2012 to 2015, that the *GAAP ETRs* of US MNCs were in fact higher compared to their European peers. However, conditional on the home country tax rates, the *GAAP ETRs* of US MNCs are approximately 3.3 percentage points lower than the *GAAP ETRs* of European MNCs. Moreover, US MNCs clearly reported lower *FOREIGN ETRs* than their European counterparts.

Our analysis suggests that these findings are mainly related to enhanced profit shifting opportunities of US MNCs associated with R&D expenditures.

We additionally examine the impact of tax legislation on effective tax differentials between US and European MNCs. First, we confirm that home country CFC legislation affects the tax expenses of MNCs. In particular, we analyze how changes in the application of CFC rules in the US and Europe have affected tax expenses. Our results suggest that the *ETRs* of US MNCs decreased significantly after the CTB introduction. We also find that the *GAAP ETRs* of European MNCs fell by approximately 2.6 percentage points after the ECJ Cadbury Schweppes judgment in 2006. Additional analyses reveal that MNCs whose activities allow for profit shifting have benefited most from a more lenient application of CFC rules. Second, we examine the switch from a worldwide tax system to a territorial tax system in the UK in 2009. Our analysis reveals that MNCs have reported significantly lower ETRs since this change in the taxation of foreign income. The switch to a territorial tax system in 2009 has reduced the *GAAP ETR* but has not influenced the *FOREIGN ETR* of UK-headquartered MNCs. Let us finally highlight that observables (tax law as well as firm characteristics) explain most of the difference in ETRs between US and European firms. However, a residual differential in the *GAAP ETR* has to be attributed to unobservable effects associated with being a US firm. Such unobservables may relate to specific preferences in what has been called "tax aggressiveness" in recent policy discussions.

Let us interpret three of our results in light of the current US tax reform. First, our findings may give ex-post support to the US tax rate cut, as our study confirms a disadvantage of US MNCs due to the high tax level in the US until 2017. However, conditional comparisons imply that the magnitude of the rate cut to a tax rate of 21 % will result in a competitive advantage for US MNCs compared to European ones. Additional analyses reveal that higher taxes of US MNCs were associated with higher deferred tax expenses, which are now likely to

become less important after the reform. Second, the switch to a territorial system will additionally benefit US firms. Our results suggest that the *GAAP ETRs* of US MNCs will further decrease after abolishing the worldwide tax system, while the *FOREIGN ETRs* will be unaffected by the implementation of the territorial tax system. Third, given a relatively lax US CFC legislation allowing for the CTB option, stricter rules on international tax avoidance may increase foreign and home effective tax payments.

Our findings have policy implications. One of the arguments in favor of a territorial system (as opposed to a worldwide system) is that it ensures a level playing field for competing firms in host markets. We show, however, that tax planning opportunities as well as tax law (implemented in the home country) are significant determinants of effective tax payments abroad (in the host market). This suggests that the system of international taxation is inefficient and that even a territorial system will not guarantee that firms compete on equal terms with each other. Hence, our findings support the view that there is first a need for more coordination in international tax policy.

Appendix

Table A1. Variable Definitions

GAAP ETR	txt / (pi – xi), i.e., income taxes divided by pre-tax income, adjusted for extraordinary items (set to zero if missing); exclude outliers
FOREIGN ETR	txfo / pifo for US MNCs, i.e., foreign income taxes divided by foreign pre-tax income; exclude outliers; (txt – txdom) / (pi – pidom) for European MNCs, i.e., domestic taxes subtracted from total taxes divided by pre-tax income excluding domestic pre-tax income; exclude outliers
CASH ETR	txpd / pi, i.e., taxes paid divided by pre-tax income; exclude outliers
CURRENT ETR	(txt - txdi) / pi, i.e., current taxes divided by pre-tax income; exclude outliers
GAAP ETR3	(txt 3yr) / (pi 3yr), i.e., income taxes (sum over three years) divided by pre-tax income (sum over three years); exclude outliers
CASH ETR3	(txpd 3yr) / (pi 3yr), i.e., cash taxes paid (sum over three years) divided by pre-tax income (sum over three years); exclude outliers
CURRENT ETR3	(txt 3yr - txdi 3yr) / (pi 3yr), i.e., current taxes (sum over three years) divided by pre-tax income (sum over three years); exclude outliers
SIZE	log (at), i.e., logarithm of total assets
ROA (Return on Assets)	pi / at, i.e., pre-tax income divided by total assets
LEV (Leverage)	(dlc + dltt) / at, i.e., total debt divided by total assets
RD (Research & Development)	xrd / at, i.e., research and development expense divided by total assets (set to zero if missing xrd)
INTAN (Intangibles)	intan / at, i.e., intangibles divided by total assets (set to zero if missing intan)
STR (Statutory Tax Rate)	Statutory corporate tax rate of the MNC's home country
US	Dummy, which is one for US MNCs and zero for European MNCs
TREATMENT (T)	Dummy, which is one for MNC treated, and zero otherwise; depending on the respective analysis, the indicator refers to European, US, or UK firms
POST	Dummy, which is one for the year of treatment and following years

Notes: Data are taken from *Compustat* and *Compustat Global*. Foreign taxes and pre-tax income for European MNCs were calculated by combining the *Compustat* and *Amadeus* databases.

Table A2. Sample Selection

	European Firms		US Firms	
Description	Firms	Firm-Years	Firms	Firm-Years
Index Firms	1,078	17,707	1,086	17,343
Headquarters in EU / US	1,052	17,289	977	15,452
Non-Missing GAAP ETR	1,031	14,038	966	12,636
Non-Missing Control Variables	1,015	13,136	965	12,574

Notes: The sample is based on firms that were included in the S&P500 or StoxxEurope600 stock market indices at least once during the period 1995 to 2015.

Table A3. Calculation of FOREIGN ETR

	Total Taxes (in Mio. USD)	**Pre-tax Income** (in Mio. USD)
Compustat Data (Worldwide Data)	**724.85**	**2,241.11**
Amadeus Data		
1st French Subsidiary	41.05	127.72
2nd French Subsidiary	28.02	112.88
…	…	…
14th French Subsidiary	1.77	6.39
∑ **Domestic Data**	**93.48**	**366.66**

$$FOREIGN\ ETR = \frac{(Total\ Taxes - Domestic\ Taxes)}{(Pretax\ Income - Domestic\ Pretax\ Income)} = \frac{(724.85 - 93.48)}{(2{,}241.11 - 366.66)}$$

$$= \frac{631.37}{1{,}874.45} = 33.68\ \% \qquad \text{Eq. (A1)}$$

We calculate the *FOREIGN ETRs* for European MNCs by subtracting domestic taxes and domestic pre-tax income from the overall tax expenses and pre-tax income. We obtain the domestic figures of European MNCs by combining ownership information with financial information taken from the *Amadeus* database provided by Bureau van Dijk. The example calculation above is given for the French-based Danone S.A. and is based on financial information from the year 2014.

Note that there could be a potential bias of our measure due to the subtraction of an aggregated unconsolidated figure (domestic data) from a consolidated base (worldwide data). Because double counting of subsidiaries profits would particularly occur at the parent level, we exclude the parent company from our calculation of the domestic data. However, untabulated results are robust to a modified calculation of *FOREIGN ETR* that includes the parent data.

Table A4. Validation of FOREIGN ETR

	Sample Period from 2002 to 2015			Sample Period from 2012 to 2015		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.
FOREIGN $ETR^{Approximation}$	92	0.2789	0.1324	21	0.2232	0.1080
FOREIGN $ETR^{Compustat}$	92	0.2726	0.1143	21	0.2227	0.1037

Notes: Validation Test for *FOREIGN ETR* calculation. Sample includes those European firms for which the *FOREIGN ETR* can be calculated first by using only *Compustat* data and second by combining *Compustat* and *Amadeus* data. *FOREIGN* $ETR^{Approximation}$ is calculated by combining *Compustat* and *Amadeus* data, as explained above. *FOREIGN* $ETR^{Compustat}$ is defined as *txfo / pifo*, i.e. foreign income taxes divided by foreign pre-tax income; data are taken from *Compustat*.

Table A5. Summary Statistics

	Panel A Years from 2012 to 2015 (unmatched Sample)						Panel B Years from 2012 to 2015 Matching Year: 2011 352 Matched Pairs					
	European Firms			**US Firms**			**European Firms**			**US Firms**		
Variables	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
SIZE *	2,248	2.36	1.77	2,003	2.77	1.43	1146	2.49	1.76	1168	2.74	1.44
ROA *	2,248	0.08	0.11	2,003	0.10	0.08	1146	0.08	0.07	1168	0.09	0.06
LEV *	2,248	0.25	0.17	2,003	0.27	0.19	1146	0.25	0.17	1168	0.27	0.18
RD *	2,248	0.01	0.03	2,003	0.02	0.04	1146	0.02	0.04	1168	0.01	0.03
INTAN *	2,248	0.23	0.21	2,003	0.22	0.21	1146	0.24	0.21	1168	0.25	0.22
STR	2,248	0.27	0.06	2,003	0.39	0.00	1146	0.28	0.06	1168	0.39	0.00
GAAP ETR	2,248	0.27	0.14	2,003	0.29	0.12	1146	0.27	0.13	1168	0.29	0.11
FOREIGN ETR	780	0.31	0.18	1,228	0.24	0.15	409	0.31	0.18	692	0.25	0.15

	Panel C Years from 1995 to 2003 Matching Year: 2001 302 Matched Pairs			Panel D Years from 2002 to 2015 Matching Year: 2005 324 Matched Pairs			Panel E Years from 2006 to 2015 Matching Year: 2008 97 Matched Pairs			Panel F Years from 2006 to 2015 Matching Year: 2008 87 Matched Pairs		
Variables	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
SIZE *	4,849	1.41	1.66	7,189	2.37	1.66	1,668	2.07	1.67	1,488	2.00	1.72
ROA *	4,849	0.09	0.08	7,189	0.09	0.09	1,668	0.11	0.08	1,488	0.09	0.07
LEV *	4,849	0.25	0.16	7,189	0.25	0.18	1,668	0.25	0.17	1,488	0.26	0.16
RD *	4,849	0.01	0.03	7,189	0.01	0.03	1,668	0.01	0.03	1,488	0.01	0.03
INTAN *	4,849	0.11	0.15	7,189	0.20	0.20	1,668	0.28	0.23	1,488	0.26	0.21
STR	4,849	0.37	0.06	7,189	0.35	0.05	1,668	0.33	0.07	1,488	0.28	0.05
GAAP ETR	4,849	0.32	0.12	7,189	0.30	0.12	1,668	0.28	0.11	1,488	0.26	0.13
FOREIGN ETR	-	-	-	3,130	0.29	0.16	916	0.29	0.17	502	0.32	0.17

Notes: Sample sizes differ usually because of data availability. All variables with "*" are used to calculate the propensity scores. Panel C includes US and European firms. Panel D includes firms from the US and firms from European countries with existing CFC rules in 2005; matching of French and Spanish MNCs is therefore based on 2004 and 2003, respectively. Panel E includes UK and US firms. Panel F includes UK and (Non-UK) European firms.

Table A6. Nearest Neighbor Matching, Balancing Property (2001)

Nearest Neighbor 1:1		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
SIZE	Unmatched	1.8270	1.1770	37.4		6.02	0.000
	Matched	1.5610	1.5820	-1.2	96.8	-0.16	0.874
ROA	Unmatched	0.0948	0.0863	10.3		1.65	0.099
	Matched	0.0849	0.0880	-3.7	63.6	-0.47	0.639
LEV	Unmatched	0.2729	0.2661	3.9		0.62	0.533
	Matched	0.2693	0.2707	-0.8	79.5	-0.10	0.919
RD	Unmatched	0.0163	0.0111	15.5		2.50	0.013
	Matched	0.0127	0.0134	-2.1	86.6	-0.26	0.795
INTAN	Unmatched	0.1255	0.1303	-3.0		-0.48	0.629
	Matched	0.1203	0.1327	-7.7	-156.6	-0.94	0.345

Notes: Balancing property tests. The tests are based on observations from the year 2001. The matching applies one-to-one nearest neighbor matching, which requires a difference in propensity scores of less than 0.02.

Table A7. CFC Countries

Countries with a CFC Rule	Countries without a CFC Rule
Denmark	Austria
Finland	Estonia
France	Belgium
Germany	Bulgaria
Greece (from 2014)	Croatia
Hungary	Cyprus
Iceland (from 2010)	Czech Republic
Italy	Ireland
Lithuania	Latvia
Norway	Liechtenstein
Poland (from 2015)	Luxembourg
Portugal	Malta
Spain	Netherlands
Sweden	Romania
United Kingdom	Slovakia
USA	Slovenia

Notes: The table is based on a list provided by Deloitte (see further: https://www2.deloitte.com/global/en/pages/tax/articles/guide-to-controlled-foreign-company-regimes. html) and the worldwide corporate tax summaries of PwC, KPMG, and EY.

Table A8. Nearest Neighbor Matching, Balancing Property (2005)

Nearest Neighbor 1:1		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
SIZE	Unmatched	1.7204	2.0680	-20.7		-4.30	0.000
	Matched	2.1110	2.0669	2.6	87.3	0.37	0.715
ROA	Unmatched	0.0971	0.1001	-3.4		-0.72	0.470
	Matched	0.0958	0.0993	-3.9	-15.2	-0.52	0.600
LEV	Unmatched	0.2457	0.2309	8.8		1.74	0.082
	Matched	0.2386	0.2506	-7.1	18.8	-0.98	0.325
RD	Unmatched	0.0110	0.0170	-18.9		-3.64	0.000
	Matched	0.0127	0.0107	6.5	65.6	0.96	0.336
INTAN	Unmatched	0.1708	0.1678	1.7		0.33	0.741
	Matched	0.1702	0.1813	-6.1	-269.1	-0.82	0.415

Notes: Balancing property tests. The tests are based on observations from the year 2005. The matching of French and Spanish MNCs is based on 2004 and 2003, respectively. One-to-one nearest neighbor matching is applied, which requires a difference in propensity scores of less than 0.02.

Table A9. Nearest Neighbor Matching, Balancing Property (2008)

Nearest Neighbor 1:1		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
SIZE	Unmatched	1.5969	2.2104	-40.1		-4.40	0.000
	Matched	1.8507	2.0369	-12.2	69.7	-0.79	0.430
ROA	Unmatched	0.1048	0.1195	-16.9		-1.73	0.085
	Matched	0.1061	0.1057	0.5	97.3	0.03	0.973
LEV	Unmatched	0.2625	0.2474	8.1		0.83	0.406
	Matched	0.2736	0.2499	12.7	-57.0	0.89	0.373
RD	Unmatched	0.0107	0.0216	-31.2		-2.90	0.004
	Matched	0.0141	0.0086	15.7	49.6	1.51	0.134
INTAN	Unmatched	0.2517	0.2172	16.4		1.70	0.089
	Matched	0.2507	0.2769	-12.5	24.1	-0.79	0.428

Notes: Balancing property tests. The tests are based on observations from the UK and the US in the year 2008. One-to-one nearest neighbor matching is applied, which requires a difference in propensity scores of less than 0.02.

Table A10. Nearest Neighbor Matching, Balancing Property (2008)

Nearest Neighbor 1:1		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
SIZE	Unmatched	1.5969	2.4133	-47.9		-4.75	0.000
	Matched	1.9644	1.9615	0.2	99.7	0.01	0.991
ROA	Unmatched	0.1048	0.0835	25.4		2.54	0.011
	Matched	0.0897	0.0803	11.3	55.6	0.88	0.380
LEV	Unmatched	0.2625	0.2839	-11.8		-1.17	0.241
	Matched	0.2880	0.2684	10.8	8.6	0.75	0.455
RD	Unmatched	0.0107	0.0143	-12.3		-1.16	0.245
	Matched	0.0125	0.0104	7.5	39.1	0.55	0.581
INTAN	Unmatched	0.2517	0.2173	17.0		1.72	0.085
	Matched	0.2629	0.2464	8.2	52.0	0.53	0.593

Notes: Balancing property tests. The tests are based on observations from the UK and other European countries in the year 2008. One-to-one nearest neighbor matching is applied, which requires a difference in propensity scores of less than 0.02.

Table A11. Probability of being US or treated Firm

	Panel B	Panel C	Panel D	Panel E	Panel F
Variables	US	Treatment	Treatment	Treatment	Treatment
	1	2	3	4	5
SIZE	0.1260***	0.1960***	-0.1050***	-0.2250***	-0.1670***
	(0.0264)	(0.0263)	(0.0199)	(0.0440)	(0.0420)
ROA	2.9840***	2.7240***	-0.6810*	-2.0230**	0.7760
	(0.5440)	(0.5970)	(0.3850)	(0.7880)	(0.8190)
LEV	0.1550	0.3740	0.2150	-0.1890	-0.4120
	(0.2240)	(0.2480)	(0.1830)	(0.3430)	(0.3750)
RD	2.3150**	3.0580**	-3.6950***	-7.0780***	-6.5090***
	(1.0610)	(1.2330)	(0.9960)	(2.1400)	(2.5000)
INTAN	-0.1260	0.1420	-0.0962	0.3750	0.5780*
	(0.1870)	(0.2550)	(0.1630)	(0.2910)	(0.3370)
N	1,139	1,036	2,263	554	457

Notes: The table presents the results of the probit estimates in respective years upon which the matching is based. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

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Chapter 4

The Cadbury Schweppes Judgment and its Implications on Profit Shifting Activities within Europe

The Cadbury Schweppes Judgment and its Implications on Profit Shifting Activities within Europe

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Abstract:

In 2006, the European Court of Justice (ECJ) decided with the Cadbury Schweppes judgment that European Controlled-Foreign-Company (CFC) rules infringe the principle of freedom of establishment and restricted the applicability thereof. This paper analyzes the impact of mandatory amendments to European CFC rules on tax planning activities within Europe. Using a difference-in-differences approach, my results provide robust evidence that pre-tax earnings of subsidiaries located in European low-tax countries have increased by around 10 % after the Cadbury Schweppes judgment. My analyses show further that the increase of pre-tax earnings is related to facilitated profit shifting activities. Multinational corporations with high incentives or enhanced profit shifting opportunities react more pronounced to the Cadbury Schweppes judgment. The findings point out that CFC rules became less effective and thus, profit shifting activities within Europe are less restricted after the ECJ judgment. Additional tests suggest further that on average 90 % of the increase in pre-tax earnings is attributable to strategic transfer pricing determination, while less than 10 % is attributable to debt shifting activities.

Keywords: CFC Rule, Cadbury Schweppes Judgment, Tax Avoidance, Profit Shifting

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Chapter 4

Tables

Figure

4.1 Introduction

In recent years, aggressive tax planning strategies of multinational corporations (MNCs) have triggered an intense public debate. So-called Controlled-Foreign-Company (CFC) rules should limit profit shifting activities. Even though CFC rules exist in most European countries, many European MNCs are still engaged in aggressive tax strategies in order to shift taxable income to low-tax countries.[101] A potential explanation is that the European Court of Justice (ECJ) "Cadbury Schweppes" judgment from September 12, 2006 (C-196/04) limited the applicability of this anti-tax avoidance rule within Europe. This paper investigates whether European CFC rules really became less effective after the ECJ judgment to provide evidence on that assumption.

Implementing a difference-in-differences approach, I show that pre-tax earnings of European low-tax subsidiaries increase by around 10 % if the parent company was affected by the Cadbury Schweppes judgment. I analyze changes in pre-tax earnings of European-owned low-tax subsidiaries, which are affected by the Cadbury Schweppes judgment, compared to US-owned low-tax subsidiaries, which are not affected by the judgment. The result gives a first hint of an increased activity of European MNCs in European low-tax countries after the ECJ judgment in 2006. My finding is robust to several variations of the dependent variables and different subsamples. Repeating the same analysis after employing different matching approaches ensures the comparability between treatment and control group and further supports my finding.

In the second part of my analyses I analyze whether the increase of pre-tax earnings is caused by profit shifting activities, as those are expected to be less restricted by CFC rules after the ECJ judgment in 2006. The findings suggest that in particular European MNCs with

[101] E.g., Ikea and Vodafone are accused, see further *Bloomberg* (19/12/2017), available at https://www.bna.com/eu-launches-tax-n73014473326/; *The Guardian* (22/10/2010), available at https://www.theguardian.com/commentisfree/2010/oct/22/vodafone-tax-case-leaves-sour-taste.

enhanced incentives or facilitated profit shifting opportunities increase their pre-tax earnings in European low-tax subsidiaries after 2005.

The third part of my paper examines which techniques in particular are used to shift pre-tax earnings to low-tax countries after CFC rules became less effective. I analyze the relative importance of the main profit shifting channels identified in previous literature: transfer pricing distortion and debt shifting activities (Dharmapala, 2014). Employing two different approaches, my results suggest that the increase of pre-tax earnings in low-tax subsidiaries after the ECJ judgment is mainly caused by strategic transfer pricing (on average more than 90 % of the overall pre-tax earnings increase is explained by transfer pricing), while debt shifting plays only a minor role (on average less than 10 %).

My study contributes to already existing literature and political discussions in several ways. First of all, the paper is related to prior research that analyzes the effectiveness of CFC rules (e.g., Egger and Wamser, 2015; Karkinsky and Riedel, 2012; Ruf and Weichenrieder, 2012). While literature focusing on CFC rules has been increasing over time, less attention is paid to the Cadbury Schweppes judgment and most of the mentioned studies above still ignore this crucial judgment. Ruf and Weichenrieder (2013) investigate the consequences with regard to the allocation of passive assets and find that German MNCs relocate those to low-tax subsidiaries more intensively after the ECJ judgment. The analyses of chapter 3 of this thesis show that the effective tax rate (ETR) of European MNCs decreases after 2005 and suggest facilitated profit shifting activities due to the ECJ judgment. As further research on this topic has not been provided so far, my study contributes to a better understanding of the impact of the Cadbury Schweppes judgment and the effectiveness of CFC rules.

Second, my study extends previous research (Heckemeyer and Overesch, 2017; Dharmapala and Riedel, 2013) that examines the relative importance of transfer pricing and

debt shifting activities. Using the same approach to disentangle the effect of the Cadbury Schweppes judgment on both profit shifting channels, my results support a stronger effect for non-financial profit shifting activities.

Third, the results of my paper are interesting for ongoing policy reforms. In a joint effort, the OECD and G20 started to develop and implement an action plan against Base Erosion and Profit Shifting (BEPS). Among others, the BEPS action plan intends to strengthen and harmonize CFC rules, thin-capitalization rules and transfer pricing requirements. My findings suggest that strengthening CFC rules will not be effective in avoiding profit shifting at all, as long as the ECJ requires exceptions for European MNCs. As debt shifting activities are less affected by the Cadbury Schweppes judgment, policy makers should particularly focus on anti-tax avoidance measures that reduce the scope of strategic transfer pricing.

The remainder of this paper is structured as follows. In the next section, I outline the impact of the Cadbury Schweppes judgment on profit shifting activities in detail and develop my hypotheses. Section 4.3 describes the research design and data. Empirical results regarding the influence of the ECJ judgment on pre-tax earnings is provided in section 4.4, while the explanations of this effect are presented in section 4.5. Section 4.6 concludes.

4.2 Background and Research Hypotheses

In line with the recent BEPS discussion, empirical literature provides convincing evidence that MNCs relocate taxable income to low-tax subsidiaries to minimize their overall tax expenses (Dischinger, Knoll, and Riedel, 2014; Dischinger, 2010; Huizinga and Laeven, 2008; Devereux and Maffini, 2007; Hines and Rice, 1994). In order to mitigate or even prevent income shifting to low-tax countries, several anti-tax avoidance measures are implemented worldwide. In this paper, I will focus on CFC rules, which are established in many countries. If a foreign subsidiary meets the criteria of a so-called controlled foreign company, CFC rules apply and foreign profits will be taxed as accrued at the (higher) tax rate of the parent

company's country. The usual privilege of exemption or deferral is not granted to this income and thus further disincentives profit shifting.

Even if CFC rules differ from country to country, they usually have three requirements in common to classify a foreign subsidiary as a controlled foreign company. First, the foreign subsidiary has to be controlled by the domestic shareholder. The requirement is generally fulfilled when the subsidiary is majority-owned (at least 50 %). Second, the foreign subsidiary has to be located in a low-tax country. A low-tax country is either defined by a low statutory tax rate (e.g., Germany defines a country as a low-tax regime when the statutory tax rate is below 25 %) or is located in a country listed on a so-called black list.[102] Third and finally, CFC rules are applicable when the foreign subsidiary generates passive income. In particular mobile income, such as interests, licenses and royalties are thought to be passive income.

A growing number of analyses confirm that CFC rules are effective in preventing income shifting to low-tax countries. Altshuler and Hubbard (2002) for example investigate essential changes made on the US CFC rules (Subpart F) in 1986 and argue that US CFC rules seem to be effective afterwards. Karkinsky and Riedel (2012) investigate the influence of European tax regimes on the number of patents located at subsidiaries and find a lower number of patents if CFC rules are binding. Ruf and Weichenrieder (2012) also confirm the economic relevance of CFC rules, as passive assets are quite lower in subsidiaries classified as controlled foreign companies. Egger and Wamser (2015) find also evidence for less investments in low-tax countries under binding CFC rules.

In 2006, the ECJ[103] decided with the Cadbury Schweppes judgment that CFC rules infringe the European principle of freedom of establishment and restricted the applicability. To be precise, CFC rules within Europe are applicable only to wholly artificial arrangements that

[102] E.g., Portugal and Sweden have established such a black list.
[103] C.f. European Court of Justice, Judgment from September 12, 2006, C-196/04.

do not reflect any economic activity, e.g., pure letter boxes, after 2005. As a consequence, European member states had to adjust their CFC rules. Thus, nowadays the threshold to prevent the CFC rules application within Europe seems to be quite low as wholly artificial arrangements can be easily avoided (Bräutigam, Spengel, and Streif, 2017).

Only a few empirical analyses have already analyzed the Cadbury Schweppes judgment. The analyses of chapter 3 of this thesis show that the ETR of listed European MNCs decreased by more than 2 percentage points after 2005 and suggest this as the intended result of increased profit shifting activities. Ruf and Weichenrieder (2013) find significant evidence that passive investments in European low-tax subsidiaries of German MNCs have increased after the ECJ judgment.

By providing a more thorough understanding of the consequences of the Cadbury Schweppes judgment, I expand prior studies. In the following, I will formulate hypotheses according to the implications of the ECJ judgment. First, I investigate whether changes in European CFC rules affect pre-tax earnings of low-tax subsidiaries. Second, I suggest an increase in profit shifting activities after the ECJ required amendments to European CFC rules. Third, I focus on the importance of different profit shifting channels through which MNCs may shift taxable income to low-tax countries after CFC rules became less effective.

(i) Consequences on Pre-Tax Earnings

First of all, I am interested in whether the ECJ judgment facilitates profit shifting activities and thus has an impact on pre-tax earnings in low-tax subsidiaries. If CFC rules became less effective after the ECJ judgment one would expect that pre-tax earnings in those controlled foreign companies will increase afterwards. This leads to my first hypothesis:

H1: Pre-tax earnings of controlled foreign companies increase after the Cadbury Schweppes judgment.

(ii) Effect of Profit Shifting Activities

Assuming the confirmation of *H1,* the increase in pre-tax earnings should be analyzed in more detail. After 2005, European CFC rules are applicable only to wholly artificial arrangements and thus are meaningless for profit shifting activities involving any economic activity. Hence, profit shifting activities within Europe are less restricted by CFC rules after the judgment and may be the reason for the increase in pre-tax earnings of controlled foreign companies. Therefore, I test the following hypothesis:

H2: The increase of pre-tax earnings of controlled foreign companies is caused by enhanced profit shifting activities after the Cadbury Schweppes judgment.

(iii) Importance of Different Profit Shifting Channels

In general, MNCs are able to influence the allocation of their taxable income to foreign subsidiaries in various ways. The primary channels are thought to be the tax efficient use of transfer prices and of intercompany debt (Dharmapala, 2014). Both channels are used to generate payments by high-tax subsidiaries to low-tax subsidiaries to relocate pre-tax earnings to low-tax countries.

To minimize the overall tax payments, MNCs may determine transfer prices resulting in an increase of pre-tax earnings generated in a low-tax country with a corresponding decrease of pre-tax earnings generated in a high-tax country (Davies, Martin, Parenti, and Toubal, 2018; Cristea and Nguyen, 2016; Riedel, Zinn, and Hofmann, 2015; Blouin, Robinson, and Seidman, 2011; Clausing, 2003; Bartelsman and Beetsma, 2003; Swenson, 2001). Intercompany prices are not unambiguously determinable and thus manipulable when market prices are not available. Market prices are unavailable for the use of intangibles (e.g., royalty payments) or individual firm specific goods and services. Furthermore, information about an MNC's intercompany prices is usually not offered by common databases. Thus, prior research confirms a relation of profit shifting activities and research and development expenses

(Grubert, 2003), intangibles (Dischinger and Riedel, 2011), and patents (Karkinsky and Riedel, 2012).

Analyzing profit shifting activities through the use of intercompany debt mainly focuses on the leverage of an MNC. MNCs thereby intend to generate deductible interest expenses in high-tax countries by granting loans from a subsidiary located in a low-tax country (Büttner and Wamser, 2013; Mintz and Weichenrieder, 2010; Desai, Foley, and Hines, 2006). Prior research shows evidence that the leverage structure is influenced by statutory tax rates (Feld, Heckemeyer, and Overesch, 2013; Huizinga, Laeven, and Nicodème, 2008; Altshuler and Hubbard, 2002).

To distinguish between the different channels of profit shifting, one could compare the tax variable effect on earnings before taxes (EBT) to the effect on earnings before interest and taxes (EBIT). Whereas the effect on EBT captures transfer pricing and debt shifting activities, EBIT excludes the results of financial activities and thus, captures transfer pricing manipulations only (Dharmapala, 2014). A meta-regression study of Heckemeyer and Overesch (2017) suggests that the major fraction of the overall BEPS volume is related to the tax efficient use of transfer pricing, while less is attributable to the strategic use of debt.

Both profit shifting channels discussed above are in general captured by CFC rules, as the implementation thereof involves passive income like royalty or interest payments. Thus, it is conceivable that both channels will be affected by the Cadbury Schweppes judgment. However, further anti-abusive rules exist and still may mitigate profit shifting activities even when CFC rules became less effective within Europe. Transfer pricing rules and documentation requirements for example are proved to be effective in avoiding profit shifting activities (Beer and Loeprick, 2015; Riedel, Zinn, and Hofmann, 2015). However, Beer and Loeprick (2015) do not find a similar mitigation effect for MNCs with high intangibles. Thus, at least MNCs

with high intangibles should be able to benefit from the Cadbury Schweppes judgment and are expected to engage in enhanced profit shifting activities after the ECJ judgment.

Further financing structures are restricted by so-called thin capitalization rules. Following prior research that those rules are effective in preventing internal debt shifting activities in general (Büttner, Overesch, and Wamser, 2017; Blouin, Huizinga, Laeven, and Nicodème, 2014; Wamser, 2014; Büttner, Overesch, Schreiber, and Wamser, 2012; Weichenrieder and Windischbauer, 2008), it is questionable to what extent the Cadbury Schweppes judgment will affect debt shifting activities.

Summing up prior research, thin-capitalization rules are effective in avoiding financial profit shifting activities, while transfer pricing rules and documentation requirements are not effective in avoiding profit shifting activities related to transfer pricing of MNCs with high intangibles overall. I expect that transfer pricing activities will be affected more by the Cadbury Schweppes judgment than debt shifting activities and define my third hypothesis as follows:

H3: The increase of pre-tax earnings of controlled foreign companies is mainly driven by transfer pricing activities.

4.3 Research Design and Data

4.3.1 Empirical Approach

Following the previous developed hypotheses, my empirical analyses are based on the subsequent steps. First, I exploit a difference-in-differences approach to identify the consequences of the Cadbury Schweppes judgment on pre-tax earnings of controlled foreign companies. Second, I add proxies for profit shifting activities into the regression to analyze the importance thereof. Third, I implement two different approaches to attribute the increase in profit shifting activities after the Cadbury Schweppes judgment to two different channels: transfer pricing distortions and debt shifting activities.

(i) Consequences on Pre-Tax Earnings

As discussed in section 4.2, I expect an increase of pre-tax earnings of European low-tax subsidiaries affected by the Cadbury Schweppes judgment, i.e., controlled foreign companies with a parent company located in a European country with binding CFC rules in 2005. To analyze the effect I employ a standard difference-in-differences approach (Meyer, 1995).

$$EBT_{it} = \gamma_1 TREATMENT_i \times POST_t + \gamma_2 X_{it} + \gamma_3 W_{jt} + \theta_i + \omega_t + u_{it}. \quad (1)$$

The dependent variable is defined as the log of pre-tax earnings of subsidiary *i* in year *t*. Therefore, I use the log of earnings before tax (EBT_{it}) in the main tests, while in additional regressions I consider the log of earnings before interest and taxes ($EBIT_{it}$).

The variable $TREATMENT_i$ equals one if subsidiary *i* is owned by a European parent company with binding CFC rules in 2005, and zero if it is owned by a US parent company. Thus, European-owned subsidiaries form the treatment group and US-owned subsidiaries form the control group in the difference-in-differences setting. $POST_t$ denotes the periods of and after the Cadbury Schweppes judgment, i.e., years from 2006 onwards. The interaction of $TREATMENT_i$ and $POST_t$ represents the difference-in-differences set-up. Thus, the coefficient γ_1 is the treatment effect I am interested in, as it measures the differential response of a treated subsidiary *i* relative to a subsidiary not affected by the ECJ judgment. I expect a significant positive effect, which would signify an increase of pre-tax earnings of European controlled foreign companies after the Cadbury Schweppes judgment.

X_{it} is a vector of selected subsidiary characteristics. These control variables on the subsidiary-level are in line with prior studies (Dischinger, 2010; Huizinga and Laeven, 2008) and consist of the log of fixed assets (*CAPITAL*) as a proxy for the use of capital, log of employee costs (*STAF*) as a proxy for the labor input, and the ratio of long term debt to total

assets (*LEV*) as a proxy for the financial leverage. Finally, W_{jt} is a vector of the host country *j* characteristics and includes the logs of gross domestic product (*GDP*), GDP per capita (*GDPC*), the unemployment rate (*UNEMPLOY*), and the corruption perception index (*CPI*).

In all regressions subsidiary (θ_i) and year (ω_t) fixed effects are included to control for unobservable subsidiary-specific factors, for a general time trend, and business cycle effects. Robust standard errors are clustered by country-years. u_{it} is a zero mean disturbance term. Please note that it is not necessary to include $TREATMENT_i$ and $POST_t$ as stand-alone variables into the regression model due to the fact that subsidiary and year fixed effects are included.

(ii) Effect of Profit Shifting Activities

Equation (1) is modified when analyzing the explanations of the increase in pre-tax earnings. As profit shifting activities are expected to be one possible reason for the increase, I expect a stronger treatment effect for MNCs with enhanced incentives in or facilitated opportunities of profit shifting activities. Therefore I create proxies and include triple interactions consisting of $TREATMENT_i$, $POST_t$ and the different profit shifting proxies into the basic regression model of equation (1), while keeping all other requirements equal.

$$EBT_{it} = \gamma_1 TREATMENT_i \times POST_t + \gamma_2 TREATMENT_i \times POST_t \times PS\ PROXY_i + \gamma_3 X_{it} + \gamma_4 W_{jt} + \theta_t + \omega_i + u_{it}. \quad (2)$$

An MNC is stronger incentivized the larger the expected benefit of profit shifting activities will be. The benefit will be larger, the lower the applicable statutory tax rate in the host country or the higher the applicable statutory tax rate in the country of its parent company is. Therefore, the first proxy is $LOW\ STR\ AFFILIATE_i$, which equals one when the statutory tax rate in the host country is equal or below 15 % in 2005, and zero otherwise. The second

proxy interacted is $HIGH\ STR\ PARENT_i$, which equals one when the statutory tax rate in the parent's country is above 25 % in 2005, and zero otherwise.[104]

Further, previous studies argue that in particular those MNCs operating in the income mobile sector (e.g., having high values of research and development expenses, and intangibles) benefit from facilitated profit shifting opportunities. Thus, the third triple interaction is made with $INCOME\ MOBILE_i$, a dummy which is one if the subsidiary's parent is operating in the income mobile sector, and zero otherwise.[105]

I expect a significant positive coefficient for γ_2 over all three modifications. This would indicate that MNCs with enhanced profit shifting incentives or profit shifting opportunities benefit most from the ECJ judgment. Thereby, I can control whether the increase of pre-tax earnings in low-tax countries is related to profit shifting activities.

(iii) Importance of Different Profit Shifting Channels

I further analyze the relative importance of the profit shifting channels after the Cadbury Schweppes judgment. I am not able to analyze the influence on transfer pricing and debt shifting activities immediately as common databases do not report transfer prices or intercompany interest payments. However, to disentangle both channels I first follow prior research and compare the regression results regarding *EBT* as dependent variable with those results when considering *EBIT* as dependent variable (Dharmapala and Riedel, 2013). To further examine the importance of transfer pricing and debt shifting channels afterwards, I modify the basic

[104] Please note that due to the use of subsidiary fixed effects I do not have to include the proxy variable as a stand-alone variable into the regression.

[105] Firms with the three-digit SIC codes 283 (Pharmaceutical), 357, 367, 737 (Computers) and 738 (Services) are classified as firms operating in the income mobile sector.

regression of equation (1) and consider various proxies of both profit shifting channels ($CHANNEL_{it}$) as dependent variable:

$$CHANNEL_{it} = \gamma_1 TREATMENT_i \times POST_t + \gamma_2 SALE_{it} + \gamma_3 SIZE_{it} + \gamma_4 W_{jt} + \theta_t + \omega_i + u_{it}. \quad (3)$$

First, I use the log of intangible assets ($INTAN_{it}$) as dependent variable to analyze the importance of transfer prices. This procedure is in line with prior studies (e.g., Dischinger and Riedel, 2011).[106] Again I employ a difference-in-differences setting with the same definitions of $TREATMENT_i$ and $POST_t$ as above. I expect an increase of transfer pricing distortions in low-tax countries and related to that an increase of intangibles on low-tax subsidiaries after the Cadbury Schweppes judgment. Thus, a significant positive sign of γ_1 is expected. Controlling for subsidiary characteristics that could further influence intangibles, I include the log of sales ($SALES_{it}$) and the log of total assets ($SIZE_{it}$). As in regression (1), I include country characteristics (W_{jt}), subsidiary (θ_i) and year (ω_t) fixed effects and robust standard errors are clustered by country-years.

Analyzing profit shifting activities related to intercompany debt I follow prior research (e.g., Dharmapala and Riedel, 2013; Huizinga, Laeven, and Nicodème, 2008) and use the leverage ratio (LEV_{it}) and the log of financial profit ($FIPL_{it}$)[107] as dependent variables in regression (3). Assuming that intercompany financing will increase after the Cadbury Schweppes judgment the leverage ratio should decrease (negative sign of γ_1, when using LEV_{it} as dependent variable) and financial profits are expected to increase (positive sign of γ_1,

[106] To avoid losing subsidiaries that do not hold any intangible assets, I follow previous studies (e.g., Weichenrieder, 2009; Hilary and Lennox, 2005; Plassmann and Tideman, 2001) and add a small constant (0.1) to the value of intangibles before computing the log of those subsidiaries.

[107] Due to an overlap of financial expenses or revenues, financial profit can be either positive or negative. As I am also interested in firms with financial losses and using logs would drop those observations, I add to each observation a constant C that reflects the smallest financial profit of the sample. Doing so, all observations have a positive financial profit while the relative distributions to other observations is not affected. Thus, even negative financial profits will be considered in the regressions. This procedure is in line with prior practice (e.g., Dharmapala and Riedel, 2013).

when using $FIPL_{it}$ as dependent variable) in controlled foreign companies after the Cadbury Schweppes judgment.

4.3.2 Data Description

This paper is based on panel data of European subsidiaries. The data is obtained from the *Amadeus* database provided by Bureau van Dijk. *Amadeus* offers unconsolidated financial statements of European subsidiaries and provides a link to the group structure.[108]

In line with the control requirement of CFC rules I define a subsidiary as a foreign one, if at least 50 % of its shares are owned by a parent company located in another country. To implement my difference-in-differences setting, I focus on subsidiaries with a European parent company restricted by CFC rules in 2005 (as those compose the treatment group) or a US parent company (as those compose the corresponding control group).[109] Spain and France anticipated the ECJ judgment and changed their CFC rules already in 2004 and 2005, respectively. As anticipation effects in these two countries would potentially blur the precise identification of the Cadbury Schweppes effect, I exclude subsidiaries with a Spanish or French parent company. Further, the sample is restricted to subsidiaries located in those countries, which met the tax threshold of common CFC rules in 2005, i.e., the year prior to the ECJ judgment. As the tax threshold of CFC rules differs and depends on the specific tax regime in the parent company's country, I use a relatively strict definition to focus on low-tax countries that are commonly triggered by CFC rules. Thus, I select subsidiaries from countries with an applicable statutory

[108] The ownership data is only available for the most recent year, which is mainly 2012 in this sample. The use of a constant ownership data could lead to a bias as group structures usually vary over time. Following previous studies (e.g., Budd, Konings, and Slaughter, 2005) I am not too concerned about this issue, since a potential misclassification would bias the results towards zero.

[109] The appendix provides more details. Please refer to table A1 of the appendix to get a detailed data development. Table A2 of the appendix provides additional information regarding the origin of all subsidiaries and table A3 of the appendix presents a list of countries with binding CFC rules in 2005.

tax rate below 20 % in 2005.[110] The selection requirements ensure that the considered subsidiaries are usually defined as controlled foreign companies if they realize passive income.

Analyzing profit shifting activities I use pre-tax earnings (*EBT*) in logs as dependent variable and exclude subsidiary-year observations with missing values. Additional financial statement information is required for the regression analyses and thus observations with missing firm characteristics were deleted.

The dataset is completed with several country specific control variables. Statutory tax rates are taken from the worldwide corporate tax summaries of PwC, KPMG, and EY. Proxies for the host country's income and development level (*GDP* and *GDPC*) and for the unemployment level (*UNEMPLOY*) are retrieved from the World Development Indicator Database. The corruption index (*CPI*) is offered by the Worldwide Governance Indicators.[111]

I reduce the sample to the years from 2003 to 2011. I exclude the years 2008 and 2009 to mitigate that my results could be driven by a potential bias raised to deviating behavior of MNCs during the financial crisis. Thus, I analyze three years prior and three years after the Cadbury Schweppes judgment. The final sample consists of 18,866 subsidiary year observations, thereof 15,250 subsidiaries are European-owned and 3,616 are US-owned, respectively.

The summary statistics presented in the appendix (table A5 of the appendix) show that European-owned subsidiaries report lower pre-tax earnings compared to US-owned subsidiaries. Further, subsidiaries with a European parent company have less employee costs

[110] Those countries are Ireland, Iceland, Latvia, Poland, Slovakia, and Hungary. Note that my basic results are essentially unchanged if a less restricted tax rate threshold of 22.5 % is considered. My results might further be underestimated as the countries listed on country-specific black lists are not necessarily included under the selected tax threshold. However, untabulated tests confirm my findings when Luxembourg, the Netherlands and Belgium are additionally considered as low-tax countries. Those countries have implemented a preferential tax regime for different types of income and are thus typically considered on a black list, e.g., on the Swedish black list.

[111] The definitions and data sources of all variables are presented in the appendix, table A4. Please note that to guarantee comparability, I use annual average exchange rates to convert financial data to Euros, if necessary.

and capital invested, while the leverage ratio is slightly larger compared to subsidiaries with a US parent company.

4.4 Consequences of the Cadbury Schweppes Judgment

4.4.1 Regression Analyses

As explained above one would expect an increase of pre-tax earnings of controlled foreign companies after the Cadbury Schweppes judgment in 2006. The following empirical analyses test this expectation by running different regressions based on equation (1). The main results are presented in table 1.

Table 1. Basic Results

Dependent Variable: EBT	1	2	3
TREATMENT x POST	0.1390***	0.1060**	0.0965**
	(0.0415)	(0.0406)	(0.0394)
STAF		0.5280***	0.5210***
		(0.0368)	(0.0355)
CAPITAL		0.0672***	0.0622***
		(0.0138)	(0.0140)
LEV		-0.6750***	-0.6720***
		(0.0620)	(0.0632)
GDP			0.1690
			(2.0340)
GDPC			-1.3130
			(1.7180)
UNEMPLOY			-0.4940**
			(0.1830)
CPI			-0.0097
			(0.0782)
Subsidiary FE	✓	✓	✓
Year FE	✓	✓	✓
N	18,866	18,866	18,866
Adj. R^2	0.782	0.798	0.798

Notes: All regressions of table 1 are based on low-tax subsidiaries with a parent company located either in a European country with binding CFC rules in 2005 (*TREATMENT* = 1) or in the US (*TREATMENT* = 0). All specifications include years from 2003 to 2011, 2008 and 2009 are excluded. All columns consider *EBT* as dependent variable. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

In all columns I use *EBT* as dependent variable. Specification (1) considers only subsidiary and year fixed effects. In specifications (2) and (3) I add subsidiary- and country-specific control variables. The coefficient of interest (γ_1) which represents the difference-in-differences estimation, is positive and significant over all specifications.

The regression of column (3) includes all control variables. The coefficient of γ_1 indicates that European-owned subsidiaries in low-tax countries were able to increase their pre-tax earnings by around 10 % after the Cadbury Schweppes judgment.[112] In line with prior research (e.g., Huizinga and Laeven, 2008) pre-tax earnings are significantly and positively related to *STAF* and *CAPITAL*, but negatively related to *LEV*. All in all, the results of table 1 support the expectation of an increase in pre-tax earnings after the Cadbury Schweppes judgment in 2006.

Related literature (e.g., Dischinger, 2010) usually controls further for the statutory tax rate (STR_{jt}) in the host country. My sample however is restricted to subsidiaries located in European low-tax countries, i.e., where the applicable statutory tax rate is below 20 % in 2005. Low variation in the statutory tax rates (e.g., the standard deviation of *STR* within the treatment group is 0.02, please refer to table A5 of the appendix) and negligible explanation power are the consequences of this restriction. Thus, for the purpose of my approach it is not necessary to include the statutory tax rate into the regression.[113]

4.4.2 Sample and Treatment Year Variations

Ensuring that the results are caused by the Cadbury Schweppes judgment I repeat previous regressions with variations in the considered time period and the composition of

[112] In line with Halvorsen and Palmquist (1980), I interpret the dummy variable coefficients (c) in this logarithmic specification with the formula *exp(c)* – 1.

[113] However, my results are also robust to controlling for the statutory tax rates in the subsidiaries' country. Huizinga and Laeven (2008) include further the parent company's country statutory tax rate to their regression and argue that this is necessary to mitigate an omitted variable bias. In untabulated tests I also include the statutory tax rate of the parent company's country and get similar results as presented above.

treatment and control group. The results are presented in table 2. All specifications are based on the same regression model as column (3) of table 1 and differ only in the considered (sub-) samples.

Table 2. Sample Variation

Dependent Variable: EBT	Shortened Time Period	Europ. CFC vs. Europ. Non CFC	German Parent vs. US Parent	UK Parent vs. US Parent
	1	2	3	4
TREATMENT x POST	0.1370***	0.0907*	0.0948***	0.1990***
	(0.0422)	(0.0527)	(0.0321)	(0.0687)
Subsidiary Controls	✓	✓	✓	✓
Country Controls	✓	✓	✓	✓
Subsidiary FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
N	9,673	20,224	11,910	5,578
Adj. R^2	0.838	0.774	0.801	0.803

Notes: Column (1) is based on low-tax subsidiaries with a parent company located either in a European country with binding CFC rules in 2005 (*TREATMENT* = 1) or in the US (*TREATMENT* = 0) and considers the years from 2004 to 2007. Specifications of columns (2) – (4) include years from 2003 to 2011, 2008 and 2009 are excluded. Column (2) is based on low-tax subsidiaries with a parent company in a European country, either with binding CFC rules in 2005 (*TREATMENT* = 1) or without (*TREATMENT* = 0). Column (3) is based on low-tax subsidiaries with a German parent company (*TREATMENT* = 1) or a US parent company (*TREATMENT* = 0). Column (4) is based on low-tax subsidiaries with a UK parent company (*TREATMENT* = 1) or a US parent company (TREATMENT = 0). Subsidiary controls include STAF, CAPITAL, and LEV. Country controls include *GDP*, *GDPC*, *UNEMPLOY*, and *CPI*. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

Specification (1) is based on the same subsidiaries as table 1, but differs from the prior analysis as it focuses on the years around the Cadbury Schweppes judgment, i.e., two years prior and after the Cadbury Schweppes judgment (from 2004 to 2007). This specification supports the expectation that pre-tax earnings of European foreign controlled companies increase after the ECJ judgment. Column (1) focuses on the years prior to the financial crisis and thus denies a potential bias arising thereof.

Furthermore I ensure that the effect is not driven by a common trend of European-owned subsidiaries[114] or a contrary trend of US-owned subsidiaries. Therefore, in column (2) of table 2

[114] To further proof that the prior found effect is not caused by a general profitability increase of European-owned subsidiaries, I include parent country-year fixed effects into the basic regressions in untabulated tests. However, controlling for a general time trend of the parent company's country does not change my basic results.

I replace the prior control group of US-owned subsidiaries by European-owned subsidiaries that should also not be affected by the ECJ judgment, i.e., subsidiaries with a parent company located in a European country without binding CFC rules in 2005. The treatment group is unchanged and still includes subsidiaries of European parent companies with binding CFC rules in 2005. The specification yields a significantly positive coefficient of γ_1, and thus is in line with previous results.

Columns (3) and (4) of table 2 repeat the basic regression based on subsamples. In column (3) I compare German-owned subsidiaries (treatment group) with US-owned subsidiaries (control group). The result indicates that German-owned subsidiaries increase their pre-tax earnings after the Cadbury Schweppes judgment. In column (4) I compare UK-owned subsidiaries as treatment group, whereas US-owned subsidiaries again form the control group. While the effect is much larger than prior found effects, these subsample results are in line with my expectation and confirm *H1*. To mitigate that the latter effect is caused by the in 2008 abolished territorial tax system in the UK, I repeat the same regression and exclude years after 2007. However, those untabulated results are similar in significance and magnitude as those shown in column (4).

Table 3 presents several placebo-type tests. Again all specifications are based on the same regression and requirements as my basic estimation and differ only in the definition of treatment- and control group (columns (1) and (2)) or in the definition of the treatment year (columns (3) and (4)).

Table 3. Placebo Tests

Dependent Variable: EBT	Sample Variation		Treatment Year Variation	
	European Non CFC vs. US	EU High-tax vs. US High-tax	TY 2005	TY 2007
	1	2	3	4
TREATMENT x POST	-0.0128	0.0135	0.0816	0.0225
	(0.0725)	(0.0140)	(0.0527)	(0.0467)
Subsidiary Controls	✓	✓	✓	✓
Country Controls	✓	✓	✓	✓
Subsidiary FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
N	8,590	145,409	18,866	18,866
Adj. R^2	0.790	0.815	0.798	0.798

Notes: Column (1) is based on low-tax subsidiaries with a parent company in a European country without binding CFC Rules in 2005 (*TREATMENT* = 1) and low-tax subsidiaries with a parent company in the US (*TREATMENT* = 0). Regression of column (2) is based on high-tax subsidiaries with a parent company located either in a European country with binding CFC rules in 2005 (*TREATMENT* = 1) or in the US (*TREATMENT* = 0). Columns (3) and (4) are based on the basic sample, i.e., on low-tax subsidiaries with a parent company in a European country with binding CFC rules in 2005 (*TREATMENT* = 1) and low-tax subsidiaries with a parent company in the US (*TREATMENT* = 0). While the Treatment Year (TY) is 2006 in columns (1) and (2), it is changed to 2005 and 2007 in column (3) and (4), respectively. Subsidiary controls include *STAF*, *CAPITAL*, and *LEV*. Country controls include *GDP*, *GDPC*, *UNEMPLOY*, and *CPI*. All specifications include years from 2003 to 2011, 2008 and 2009 are excluded. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

The placebo test in column (1) considers low-tax subsidiaries of European parent companies with no binding CFC rules in 2005 as treatment group, while low-tax subsidiaries with US parent companies still constitute the control group. As the (placebo) treatment group in this sample should not be affected by the Cadbury Schweppes judgment, the insignificant coefficient is in line with my expectation.

The sample of specification (2) again compares European-owned subsidiaries with US-owned subsidiaries. However, in this specification I do not concentrate on subsidiaries in low-tax countries, instead I consider those subsidiaries located in high-tax countries where the applicable statutory tax rate were equal or above 20 % in 2005, e.g., Germany, France or Italy. This leads to a quite larger sample size. Due to the facts that the tax threshold of common CFC rules is no longer full filled for those subsidiaries and higher tax rates should not incentivize profit shifting activities, pre-tax earnings should not increase after the Cadbury Schweppes judgment. Even more, I would expect a negative treatment effect in this composition, as profit

shifting activities usually result in an increase of pre-tax earnings in low-tax countries and a corresponding decrease in high-tax countries. However, the coefficient in column (2) is neither significant nor negative, and thus suggests that the Cadbury Schweppes judgment does not affect subsidiaries located in high-tax countries.[115]

Finally, I run two placebo tests regarding the treatment year. Therefore I consider the same treatment and control group as in the basic regression and chose the years 2005 (column (3)) and 2007 (column (4)) as treatment years. As the Cadbury Schweppes judgment was in 2006, I do not expect a treatment effect in these two modifications. The insignificant coefficients in columns (3) and (4) confirm the expectation.

4.4.3 Matched Sample Analyses

The perfect setting to analyze the effect of the Cadbury Schweppes judgment on profit shifting activities decision would require observing each subsidiary first with a European parent company (treated) and second with a US parent company (not treated) in each period. As a subsidiary is either European- or US-owned, it is not possible to observe how the (treated) subsidiary would have performed without being affected by the Cadbury Schweppes judgment. The best alternative then is to create an adequate control group that is as similar as possible to the treatment group regarding several subsidiary characteristics.

Propensity score matching is an appropriate technique to build such an adequate control group and further addresses a potential selection bias (Caliendo and Kopeinig, 2008; Titus, 2007). Applying the propensity score matching involves a two-step procedure: First, the

[115] A possible explanation therefor might be the small (big) share of pre-tax earnings located in low-tax (high-tax) subsidiaries. Based on the overall pre-tax earnings of all European subsidiaries within a group, only 8 % are attributable to low-tax subsidiaries while the remaining 92 % are attributable to high-tax subsidiaries. My basic results suggest a 10 % increase in pre-tax earnings of low-tax subsidiaries after the ECJ judgment. Even assuming a completely corresponding (decreasing) effect in high-tax subsidiaries, the effect would be much smaller in magnitude due to the relatively high amount of pre-tax earnings in high-tax subsidiaries. Thus, I am not too concerned about not finding a significant negative effect in column (2).

probability $\widehat{p_i}$ that the subsidiary *i* has a European parent company has to be predicted. Assuming a probit model I estimate the following probability regression:

$$TREATMENT_{i,\,2005} = \beta_1 X_{i,\,2005} + \varepsilon_{i,\,2005}. \quad (4)$$

Equation (4) indicates that the probability of being European-owned depends on firm-specific characteristics, captured by $X_{i,2005}$. The index 2005 indicates that all variables are measured in 2005, which is the year prior to the Cadbury Schweppes judgment. The vector $X_{i,2005}$ includes subsidiary characteristics that are considered as determinants of pre-tax earnings (e.g., Caliendo and Kopeinig, 2008; Augurzky and Schmidt, 2001). In line with the subsidiary-specific control variables defined in section 4.3.1, I consider *STAF*, *CAPITAL*, and *LEV* as relevant determinants.

Second, I apply a one-to-five nearest neighbor matching. Based on the estimated propensity scores of the first step, each treated subsidiary (European-owned) is matched to one or maximum five non-treated subsidiaries (US-owned). I require that only subsidiaries within the same industry[116] and year (2005) will be matched and that the difference in propensity scores is less than 0.01.[117] The overall good matching quality is shown in table 4. Table 4 shows that the bias has been drastically reduced for all characteristics and remaining differences are not significant after the matching procedure.[118]

[116] According to the Fama and French classification of 17 different industry groups.
[117] Untabulated results based on the chosen one-to-five nearest neighbor matching are robust to applying a caliper of 0.02 and 0.03.
[118] Figure A1 of the appendix demonstrates graphically that the standardized bias is reduced for each firm characteristic after applying the propensity score matching.

Table 4. One-to-Five Nearest Neighbor Matching Quality

Nearest Neighbor 1:5		Mean		Bias	Bias Reduction	t-test	
		Treated	Control	(in %)	(in %)	t	p>t
STAF	Unmatched	6.4429	7.0483	-38.2		-6.38	0.000
	Matched	6.4551	6.4433	0.7	98.0	0.21	0.836
CAPITAL	Unmatched	6.5829	6.7883	-8.5		-1.42	0.155
	Matched	6.3678	6.3322	1.5	82.6	0.38	0.704
LEV	Unmatched	0.0958	0.0631	23.7		3.78	0.000
	Matched	0.0790	0.0777	1.0	96.0	0.25	0.806

Notes: Table 4 compares the means of the relevant matching characteristics between European-owned and US-owned subsidiaries before and after the matching. The control group is determined by the propensity score in the year prior to the Cadbury Schweppes judgment, i.e., 2005. The results are formed on one-to-five nearest neighbor matching requiring a difference in propensity score of less than 0.01. Variables are defined in table A4 of the appendix.

Table 5 further shows that the observable characteristics do no longer explain the parent company's origin of a subsidiary. The explanatory power in terms of pseudo-R2 is drastically reduced and the observables are not only separately insignificant as shown in table 4 but also jointly insignificant ($p>\chi^2 = 0.9810$). As well the mean (median) bias between treatment and control group before and after the matching and across all characteristics is reduced from 23.5 % (23.7 %) to 1.1 % (1.0 %). Concluding, the results confirm an overall good matching quality.

Table 5. Joint Insignificance of Observables after Matching

			Bias	
Sample	Pseudo - R^2	$p>\chi^2$	Mean	Median
Unmatched	0.0400	0.0000	23.50	23.70
Matched	0.0000	0.9810	1.10	1.00

Notes: Based on the one-to-five nearest neighbor matching table 5 describes the jointly explanatory power of the selected subsidiary characteristics before and after the matching procedure.

The matched sample consists of 340 treatment subsidiaries and 1,254 control subsidiaries. Based on the matched sample, I continue my analyses by running the basic difference-in-differences regressions as in section 4.4.1. Combining those two approaches, i.e., propensity score matching and the following difference-in-differences analyses, further mitigates a potential omitted variables bias (Caliendo and Kopeinig, 2008; Heckman, Ichimura, Smith, and Todd, 1998). Table 6 presents the difference-in-differences results with subsidiary and year fixed effects and robust standard errors clustered by country-years. Column (1)

describes the estimation based on the matched sample. The positive and significant coefficient (0.1160) suggest an increase of pre-tax earnings for European-owned subsidiaries after the Cadbury Schweppes judgment of around 12 %. The result is consistent with my prior findings and thus confirms my expectations.

Table 6. Difference-in-Differences Results after Matching

Dependent Variable: EBT	1:5 NN	1:1 NN	Kernel
	1	2	3
TREATMENT x POST	0.1160**	0.2790**	0.1220***
	(0.0480)	(0.1270)	(0.0434)
Subsidiary FE	✓	✓	✓
Year FE	✓	✓	✓
N	8,730	620	10,517
Adj. R^2	0.755	0.757	0.762

Notes: Table 6 presents the difference-in-differences results of equation (1) after one-to-five, one-to-one nearest neighbor and kernel matching. The treatment group includes 340, 56, and 340 observations and the control group 1,254, 56, and 1,592 observations respectively. All specifications include years from 2003 to 2011, 2008 and 2009 are excluded. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

I repeat the analysis using different matching procedures to ensure that the result is not driven by the choice of matching method. Columns (2) and (3) show the difference-in-differences results based on a one-to-one nearest neighbor and a kernel matching, respectively. While one-to-one nearest neighbor matching reduces the sample to only 56 treatment and control subsidiaries each, the estimated coefficients of 0.2790 is quite above prior results. However, applying different matching procedures yields significant positive effects on pre-tax earnings for European-owned subsidiaries after the Cadbury Schweppes judgment. Moreover, all presented results stay robust when using *EBIT* as dependent variable, as untabulated tests show similar, significant coefficients. All in all, the findings of the robustness tests further confirm *H1* and suggest an increase of pre-tax earnings in European controlled foreign companies after the ECJ judgment in 2006.

4.5 Explanations of the Identified Consequences

4.5.1 Profit Shifting Activities

With further analyses I test H2 and examine whether the increase of pre-tax earnings after the Cadbury Schweppes judgment is related to profit shifting activities. Therefore, I make use of proxies that either incentivize or facilitate profit shifting activities, and interact those proxies with *TREATMENT* and *POST* as demonstrated in equation (2). Expecting that profit shifting activities are the drivers of the increase in pre-tax earnings found in section 4.4, I anticipate an additional treatment effect for those subsidiaries with enhanced profit shifting incentives or opportunities. The results are presented in table 7.

Table 7. Additional Treatment Effects

Dependent Variable: EBT	1	2	3
TREATMENT x POST	0.0906**	-0.1740	0.0882**
	(0.0400)	(0.1700)	(0.0399)
TREATMENT x POST x LOW STR SUBSIDIARY	0.4850**		
	(0.2160)		
TREATMENT x POST x HIGH STR PARENT		0.2790*	
		(0.1550)	
TREATMENT x POST x INCOME MOBILE			0.1090*
			(0.0603)
Subsidiary Controls	✓	✓	✓
Country Controls	✓	✓	✓
Subsidiary FE	✓	✓	✓
Year FE	✓	✓	✓
N	18,866	18,866	18,866
Adj. R^2	0.798	0.798	0.798

Notes: All regressions are based on low-tax subsidiaries with a parent company located either in a European country with binding CFC rules in 2005 (*TREATMENT* = 1) or in the US (*TREATMENT* = 0). Subsidiary controls include *STAF*, *CAPITAL*, and *LEV*. Country controls include *GDP*, *GDPC*, *UNEMPLOY*, and *CPI*. All specifications include years from 2003 to 2011, 2008 and 2009 are excluded. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

First, the incentive of profit shifting should be higher the lower the statutory tax rate in the host country is. Column (1) presents the result when including the triple interaction of *TREATMENT*, *POST* and *LOW STR SUBSIDIARY* into the basic regression model (1). The positive coefficient of 0.4850 indicates that after the Cadbury Schweppes judgment pre-tax

earnings increase even stronger in those subsidiaries located in countries with extremely low statutory tax rates.

Second, the incentive of profit shifting should also be stronger the higher the statutory tax rate in the parent company's country is. Therefore, I interact the proxy *HIGH STR PARENT*, which equals one if the statutory tax rate in the parent company's country is above 25 %, and zero otherwise. The result of the triple interaction of *TREATMENT*, *POST* and *HIGH STR PARENT* is shown in column (2) and demonstrates as well an additional treatment effect.

Finally, the treatment effect should also be more pronounced for MNCs with enhanced profit shifting opportunities. Column (3) shows a positive coefficient and indicates an additional increase of pre-tax earnings for low-tax subsidiaries related to a group, which is operating in the income mobile sector and thus is expected of having facilitated profit shifting opportunities. Overall these findings support *H2*, stating that the increase of pre-tax earnings after the Cadbury Schweppes judgment is related to profit shifting activities.

4.5.2 Profit Shifting Channels

As pre-tax earnings can be shifted in various ways from high to low-tax countries (Bartelsman and Beetsma, 2003), I continue analyzing the effect of the Cadbury Schweppes judgment on those different profit shifting channels. First of all, I compare the treatment effects found in my prior analyses when using *EBT* as dependent variable with the treatment effect when using *EBIT* as dependent variable. The results are summarized in table 8.

Table 8. Profit Shifting Channels

Dependent Variables	EBT	EBIT	Increase explained by Debt Shifting	Increase explained by Transfer Pricing
	1	2	3	4
(1) Basic Regression	0.0965** (0.0394)	0.0901** (0.0391)	4.49 %	95.51 %
(2) Shortend Time Period	0.1370*** (0.0422)	0.1130** (0.0407)	15.63 %	84.37 %
(3) European CFC vs. European Non CFC	0.0907* (0.0527)	0.0778* (0.0396)	12.25 %	87.75 %
(4) German Parent vs. US Parent	0.0948*** (0.0321)	0.0792* (0.0445)	14.54 %	85.46 %
(5) UK Parent vs. US Parent	0.1990*** (0.0687)	0.1670*** (0.0474)	14.15 %	85.85 %
(6) Matching 1:5 NN	0.1160** (0.0480)	0.1100*** (0.0404)	3.00 %	97.00 %
(7) Matching 1:1 NN	0.2790** (0.1270)	0.2700** (0.0987)	1.00 %	99.00 %
(8) Matching Kernel	0.1220*** (0.0434)	0.1240*** (0.0381)	-3.97 %	103.97 %

Notes. The table summarizes the prior findings regarding *EBT* in column (1) and show the treatment effects on *EBIT* in column (2). All regressions are based on low-tax subsidiaries. The prior used control variables (*STAF, CAPITAL, LEV, GDP, GDPC, UNEMPLOY, CPI*) as well as subsidiary and year fixed effects are included. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

Column (1) of table 8 summarizes the coefficients for the treatment effect (γ_1) on *EBT* of the prior analyses. Column (2) shows the results when repeating same regressions with *EBIT* as dependent variable. Overall specifications the treatment effect is significant and positive. Except of modification (8), the treatment effect on *EBT* is always slightly larger than the effect on *EBIT*. At the first glance the finding is reasonable, as *EBT* captures all profit shifting activities and should therefore react more pronounced than *EBIT*, which in particular excludes debt shifting activities. However, I cannot compare the two effects immediately as both refer to different bases. Following Heckemeyer and Overesch (2017) I use the following equation to disentangle the effect of transfer pricing activities on the overall *EBT* effect:

$$\gamma_{TP} = \gamma_{EBIT} \frac{\overline{EBIT}}{\overline{EBT}}. \quad (5)$$

The sample means ratio of *EBIT* over *EBT* is 1.023, indicating that on average *EBIT* is 2.3 % higher than *EBT*.[119] Multiplying this ratio with my basic effect on *EBIT* in column (2) results in 0.0922 (= 1.023 * 0.0901), which represents the treatment effect related to transfer pricing activities. Interpreting the results shows that the overall treatment effect on *EBT* is mainly caused by transfer pricing activities (i.e., by 95.51 %)[120], while the residual and thus little is driven by debt shifting activities (4.49 %). The shares of transfer pricing and debt shifting on the treatment effect for all modifications made in this paper are presented in columns (3) and (4), respectively. Overall specifications, on average more than 90 % of the increased profit shifting activities is related to transfer pricing and less than 10 % is related to debt shifting.[121]

These findings are in line with my expectation that transfer pricing activities are more affected by the Cadbury Schweppes judgment than debt shifting activities and thus confirm *H3*. To further support those results, I continue analyzing the effect of the Cadbury Schweppes judgment on both profit shifting channels. In particular, I analyze the effects of the Cadbury Schweppes judgment on already prior used proxies for transfer pricing and debt shifting activities. The results based on equation (3) are shown in table 9.

[119] Due to the use of unconsolidated financial statements of the subsidiaries, this ratio itself might be affected by profit shifting activities. To mitigate a potential bias the computation of a ratio based on consolidated statements is recommended. In untabulated test, I compute the ratio of *EBIT* over *EBT* based on consolidated data offered by *Compustat* and *Compustat Global*. This procedure however leads to similar findings as the presented results.

[120] Derived by computing [(0.0922/0.0965)*100 = 95.51 %].

[121] Specification (8) suggest that more than 100 % of the overall profit shifting activities are attributable to transfer pricing activities. As the result is difficult to interpret, I do not include this finding by calculating the average effects related to both profit shifting channels.

Table 9. Proxies for Profit Shifting Channels

Dependent Variables	INTAN	FIPL	LEV
	1	2	3
TREATMENT x POST	0.1310**	0.0002	-0.0033
	(0.0619)	(0.0002)	(0.0041)
Subsidiary Controls	✓	✓	✓
Country Controls	✓	✓	✓
Subsidiary FE	✓	✓	✓
Year FE	✓	✓	✓
N	18,866	18,866	18,866
Adj. R^2	0.501	0.142	0.625

Notes: All regressions are based on low-tax subsidiaries with a parent company located either in a European country with binding CFC rules in 2005 (*TREATMENT* = 1) or in the US (*TREATMENT* = 0). Subsidiary controls include *SALES* and *SIZE*. Country controls include *GDP*, *GDPC*, *UNEMPLOY*, and *CPI*. The sample includes years from 2003 to 2011, 2008 and 2009 are excluded. Robust standard errors are clustered by country-years and are shown in parentheses. *, **, and *** show significance at the level of 10 %, 5 %, and 1 %, respectively.

I find an increase of intangibles by around 14 % for low-tax subsidiaries affected by the ECJ judgment in column (1). Even the coefficient is positive for financial profits and negative for the leverage in columns (2) and (3), I do not find significant treatment effects on those proxies for controlled foreign companies. Taken those results together, it supports the prior findings and supports *H3* that the increase of low-tax subsidiaries' pre-tax earnings is mainly driven by enhanced transfer pricing activities while debt shifting is less important.

Two findings should be mentioned to conclude these analyses. First my results are in line with prior findings demonstrating that the major fraction of international income shifting derives from the strategic distortion of transfer prices. Second, the results are reasonable regarding previous research results showing that thin capitalization rules are suitable to avoid debt shifting while transfer pricing rules are still not able to prevent several tax avoiding strategies.

4.6 Conclusion

This paper contributes to the prior literature by providing convincing evidence that less effective CFC rules facilitate profit shifting activities of MNCs. While previous studies focus on the allocation of assets or the effect on overall tax expenses of MNCs, this paper provides evidence about the extent of increased pre-tax earnings in low-tax subsidiaries and the channels used for profit shifting activities after the Cadbury Schweppes judgment.

Using a difference-in-differences approach, my empirical results show a significant increase of pre-tax earnings in low-tax subsidiaries after the ECJ judgment. Several robustness tests confirm the expectation and indicate that pre-tax earnings of affected low-tax subsidiaries have increased by approximately 10 % after the Cadbury Schweppes judgment. Furthermore, additional tests ensure that the increase is related to profit shifting activities and is mainly driven by the strategic determination of transfer prices within MNCs, while debt shifting activities are less material.

My results suggest that strengthening CFC rules could limit profit shifting activities. However, I acknowledge that my study is not free of limitations. Most notably, due to the lack of data, I am not able to analyze profit shifting activities in a direct manner. Future research with access to intercompany transactions could provide deeper insights. Nevertheless, my analyses provide convincing evidence as they rely on already proved proxies of prior research.

Appendix

Table A1. Sample Selection

Description	Firms	Firm-Years
Available in Database	953,439	6,201,377
Foreign Subsidiaries	169,777	1,093,854
Low-Tax Subsidiaries	31,372	185,218
Headquarters in EU / US	14,619	89,459
Non-Missing and Positive EBT	12,020	55,804
Non-Missing Control Variables	5,605	25,479
Excluding Years of Financial Crisis	5,449	18,866

Notes: The sample is based on firms that were incorporated in European low-tax countries and includes the years from 2003 to 2011, 2008 and 2009 are excluded.

Table A2. Country Overview

	# of foreign subsidiaries with		
	European Parent **with** CFC rules	European Parent **without** CFC rules	US Parent
Low-tax Countries			
Ireland	924	140	869
Iceland	18	9	8
Latvia	154	33	5
Poland	9,090	2,113	1,651
Slovakia	3,035	2,319	523
Hungary	2,029	360	560
Total	**15,250**	4,974	**3,616**
High-tax Countries			
Germany	4,841	2,465	5,089
France	19,320	10,607	9,098
Netherlands	1,737	511	1,179
Italy	7,482	3,407	4,462
UK	8,217	4,222	13,808
Denmark	1,500	196	571
Portugal	2,436	1,045	1,153
Spain	11,878	2,627	4,481
Belgium	5,639	2,539	3,641
Luxembourg	597	357	223
Norway	6,169	445	1,012
Sweden	6,104	659	1,652
Finland	3,707	412	948
Austria	2,705	353	656
Malta	34	0	2
Estonia	2,464	174	200
Czech Rep.	8,099	2,815	1,727
Slovenia	1,125	427	189
Croatia	1,047	233	217
Total	95,101	33,494	50,308

Notes: The main sample of the analysis consists of foreign subsidiaries in low-tax countries (**# 18,866**) with a parent company located in a European country with binding CFC rules in 2005 (**# 15,250**) and those with a US parent company **(# 3,616**). The remaining information of this table is relevant to understand the composition of created subsamples in robustness tests.

Table A3. European Countries with CFC Rules

European Countries with binding CFC Rules in 2005
Denmark
Finland
France *
Germany
Hungary
Italy
Lithuania
Norway
Portugal
Spain *
Sweden
United Kingdom

Notes: Based on a document provided by Deloitte (see further: https://www2.deloitte.com/global/en/pages/tax/articles/guide-to-controlled-foreign-company-regimes.html) this table includes European countries with binding CFC rules in 2005. My treatment group consists of foreign low-tax subsidiaries with a parent company located in one of the countries listed at this table. Please note that due to the anticipation of the Cadbury Schweppes judgment and the early amendments in French and Spanish CFC rules, I exclude observations with a parent company location in France or Spain (labeled with *).

Table A4. Variable Definition

EBT	Pre-tax earnings in logs
EBIT	Earnings before interest and taxes in logs
TREATMENT	Dummy, which is one for a subsidiary affected by the Cadbury Schweppes judgment, and zero otherwise
POST	Dummy, which is one for the year of the Cadbury Schweppes judgment (2006) and following years
STAF	Labor compensation in logs
LEV	Ratio of long term debt to total assets
SALES	Sales in logs
CAPITAL	Fixed assets in logs
SIZE	Total assets in logs
FIPL	Financial profit in logs
INTAN	Ratio of intangibles over total assets in logs
LOW STR SUBSIDIARY	Dummy, which is one if the statutory tax rate in the host country is equal or below 15 %, and zero otherwise
HIGH STR PARENT	Dummy, which is one if the statutory tax rate of the parent company's country is above 25 %, and zero otherwise
INCOME MOBILE	Dummy, which is one if the parent company operates in the income mobile sector, and zero otherwise
GDP	Gross domestic product in logs of the host country
GDPC	Gross domestic product per capita of logs in the host country
UNEMPLOY	Unemployment rate in logs of the host country
CPI	Corruption index in logs of the host country
STR	Statutory corporate tax rate of the host country

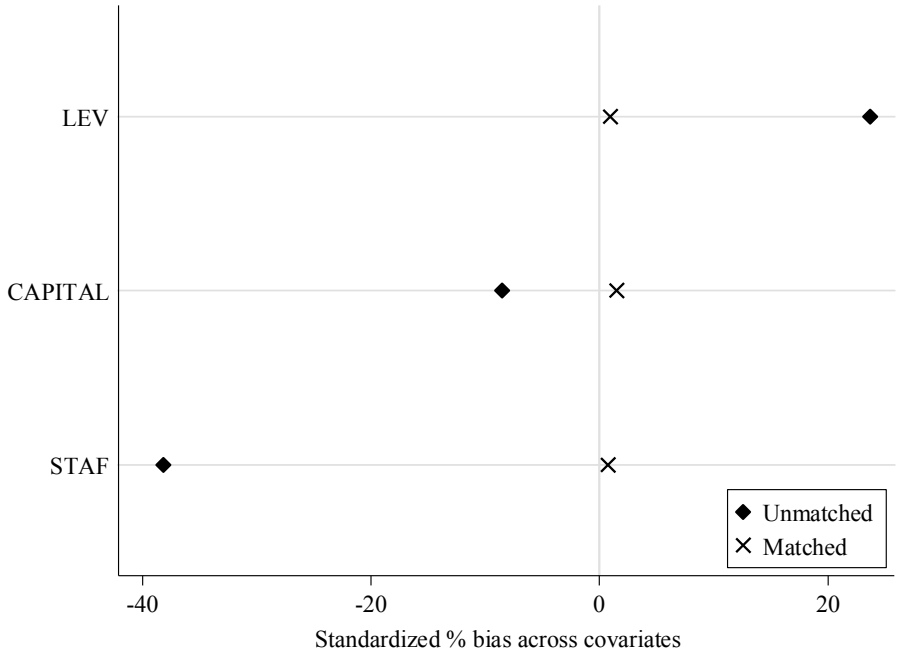
Notes: Firm data are taken from *Amadeus* database. *GDP, GDPC,* and *UNEMPLOY* are taken from the World Bank Development Indicators database. *CPI* is retrieved Worldwide Governance Indicators database. *STRs* were collected from the worldwide corporate tax summaries of PwC, KPMG, and EY.

Table A5. Summary Statistics

	Subsidiaries with a European Parent			Subsidiaries with a US Parent		
Variable	N	Mean	Std. Dev.	N	Mean	Std. Dev.
EBT	15,250	5.94	1.95	3,616	6.81	2.01
EBIT	15,210	6.09	1.81	3,615	6.85	1.91
TREATMENT	15,250	1.00	0.00	3,616	0.00	0.00
TREATMENT x POST	15,250	0.74	0.44	3,616	0.00	0.00
STAF	15,250	6.54	1.66	3,616	7.32	1.62
CAPITAL	15,250	6.56	2.51	3,616	6.82	2.66
LEV	15,250	0.10	0.16	3,616	0.07	0.13
GDP	15,250	25.86	0.75	3,616	25.85	0.65
GDPC	15,250	9.14	0.46	3,616	9.41	0.70
UNEMPLOY	15,250	2.45	0.34	3,616	2.37	0.42
CPI	15,250	-1.10	0.62	3,616	-0.76	0.83
STR	15,250	0.19	0.02	3,616	0.18	0.03

Notes: The main sample of the analysis (# 18,866) consists of foreign subsidiaries in low-tax countries with a parent company located in a European country with binding CFC rules in 2005 (# 15,250) and those with a US parent company (# 3,616).

Figure A1. Bias Reduction after Propensity Score Matching



Notes: The figure demonstrates that the standardized bias is reduced for each subsidiary characteristic after applying the propensity score matching. The points and crosses in the figure compare the standardized bias before and after the employed one-to-five nearest neighbor matching.

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Chapter 5

Concluding Remarks

5 Concluding Remarks

This thesis analyzes tax differentials between US and European firms. The three essays provide a better understanding of tax differentials that exist between US and European firms and explore the potential determinants thereof.

Chapter 2 reviews the definitions of effective tax rates (ETRs) as common proxies used for tax expenditures and thus contributes to literature that spends effort in interpreting the information content of different ETR measures. In addition, it illustrates the differences in ETRs between US and European firms. While previous research comes to confounding results when comparing tax expenditures between US and European firms, the results of chapter 2 suggest that conflicting findings of prior analyses can be attributed to the use of different ETR measures: higher tax expenditures in terms of *GAAP ETR* and lower tax expenditures in terms of *CURRENT ETR*, *CASH ETR*, and *FOREIGN ETR* are found for US firms compared to European firms. Additional analyses of chapter 2 demonstrate that higher *GAAP ETRs* of US firms are in particular attributable to higher deferred tax liabilities compared to European firms.

Chapter 3 builds on the insights of chapter 2 as it uses the prior presented ETR measures to analyze tax differentials between US and European firms with a more detailed approach. In particular, pairs of similar US and European firms, given observable firm characteristics, were identified. Running regressions on the matched sample that condition on pair fixed effects allows to analyze effective tax rate differentials that arise between very similar US and European firms. These pairwise comparisons confirm the prior results of chapter 2: US firms face higher *GAAP ETRs* compared to their European peers, while *CURRENT ETRs*, *CASH ETRs*, and *FOREIGN ETRs* are lower for US firms.

Additional analyses in chapter 3 are concerned with the determinants of tax differentials. The results suggest that most of the tax differential between US and European firms can be explained by observable firm characteristics and home country tax law. For example, US firms

face a competitive disadvantage due to the higher statutory tax rate applicable in the US until the tax reform in 2017. However, enhanced profit shifting opportunities of US firms associated with research and development expenditures let US firms compensate that disadvantage. Moreover, the applicable international tax system and the effectiveness of Controlled Foreign Company (CFC) rules in the home country of a firm affect its tax expenditures. The results suggest that ETRs decrease significantly after CFC rules became less effective. For example, ETRs of US firms fell by around 4.6 percentage points after the so-called "Check the Box" (CTB) introduction made it possible to avoid the application of US CFC rules. A similar decrease is found for ETRs of European firms after the Cadbury Schweppes judgment required amendments to CFC rules within Europe. While CFC rules affect *GAAP ETRs* and *FOREIGN ETRs*, the international tax system impacts *GAAP ETRs* only.

Chapter 4 continues to evaluate the impact of CFC rules on tax expenditures and contributes to previous literature that analyzes the relevance of anti-tax avoidance measures. The empirical results in chapter 4 suggest that profit shifting activities increase after CFC rules became less effective within Europe. After the Cadbury Schweppes judgment in 2006, pre-tax earnings of European-owned subsidiaries located in low-tax countries increased by around 10 percent compared to US-owned subsidiaries. Additional tests demonstrate that the increase in pre-tax earnings is in particular attributable to transfer pricing activities. The results suggest that strengthening CFC rules, as currently followed with the Base Erosion and Profit Shifting (BEPS) action plan by the OECD, is likely to limit profit shifting activities.

Overall, this thesis addresses current developments in international tax legislations as for example the US tax reform and the BEPS action plan followed by the OECD. The analyses enhance the understanding of existing tax differentials between US and European firms prior to the US tax reform in 2017: conditional on the home country tax rates, US firms had already lower tax expenditures prior to the US tax reform. In particular, tax planning opportunities and

the home country tax legislation are significant determinants of those tax differentials between US and European firms. The findings let assume that the tax rate cut and the abolishment of the worldwide tax system in the US after the tax reform will increase the tax differential and will result in a competitive advantage for US firms compared to their European peers.